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FRACTIONS

Find the exact value of each of the following without using a calculator. All working must be shown. Express your answers in the lowest terms.

1. June 89

   a. $\left(4\frac{4}{5}\div 2\frac{2}{3}\right)-\left(1\frac{1}{3}\right)^2$ [5 marks]

   b. Write your answer to part a as a decimal to two significant figures [2 marks]

2. Jan 89

$$\frac{5\frac{1}{4}-2\frac{1}{3}}{2\frac{1}{2}}$$ [4 marks]

3. Jan 90

$$\frac{3\frac{1}{3}\times 1\frac{1}{5}}{3\frac{1}{3}-1\frac{1}{5}}$$ [4 marks]

4. June 90

$$\frac{4\frac{1}{3}-1\frac{5}{6}}{1\frac{3}{7}\times 1\frac{2}{3}}$$ [3 marks]

5. Jan 91

$$\frac{2\frac{1}{3}+\frac{3}{7}}{2\frac{1}{3}\times 1\frac{3}{7}}$$ [5 marks]

6. June 91

$$\left(2\frac{1}{3}-1\frac{5}{6}\right)\div 1\frac{1}{3}$$ [4 marks]

7. June 92

$$\frac{5\frac{2}{7}+3\frac{5}{7}}{4-2\frac{4}{5}}$$ [4 marks]

8. June 93

$$\left(3\frac{2}{7}+1\frac{2}{3}\right)\div 1\frac{1}{7}$$ [4 marks]

9. Jan 93

$$\frac{5\frac{4}{6}-4\frac{2}{3}}{3\frac{2}{3}}$$ [3 marks]

10. Jan 95

$$\frac{\frac{1}{5}\times\frac{3}{10}}{2\frac{1}{2}}$$ [2 marks]

11. June 95

$$\left(3\frac{3}{5}\times 1\frac{2}{3}\right)-2\frac{2}{7}$$ [3 marks]

12. Re-sit 95

$$\frac{2\frac{2}{3}-1\frac{5}{6}}{\frac{2}{3}}$$ [3 marks]

13. Jan 96

$$\frac{1}{7}+\left(\frac{2}{3}\div\frac{11}{12}\right)$$ [3 marks]

14. Jun 96

$$\frac{2\frac{1}{3}-1\frac{1}{2}}{1\frac{5}{6}}$$ [2 marks]

15. Jan 97

$$\left(1\frac{1}{7}+2\frac{2}{3}\right)\div 2\frac{2}{3}$$ [3 marks]

16. Jan 98

$$\frac{3-\frac{1}{3}}{3+\frac{1}{5}}$$ [3 marks]

17. Jun 98

$$\frac{\frac{2}{3}+1\frac{2}{7}}{3-2\frac{2}{7}}$$ [4 marks]

18. Jun 99

$$\frac{2\frac{1}{7}-\frac{1}{3}}{1\frac{6}{7}}$$ [4 marks]

19. Jun 00

$$1\frac{1}{3}-3\frac{5}{6}\div 5\frac{1}{9}$$ [4 marks]

20. Jan 00

$$\frac{8\frac{1}{3}-2\frac{1}{2}}{2-\frac{5}{6}}$$ [4 marks]

21. Jan 01

$$\frac{4\frac{1}{8}-3\frac{3}{4}}{1\frac{1}{7}}$$ [5 marks]

22. Jun 01

$$\frac{3\frac{1}{7}-\frac{2}{3}}{2\frac{6}{7}}$$ [3 marks]

23. Jan 02

$$1\frac{2}{3}+2\frac{1}{8}\div\frac{3}{4}$$ [4 marks]

24. Jun 02

$$\frac{3\frac{1}{4}-2\frac{1}{3}}{1\frac{5}{6}}$$ [3 marks]

25. Jan 03

$$\frac{3\frac{1}{2}+1\frac{5}{6}}{1\frac{3}{5}}$$ [4 marks]

26. Jun 04

$$\frac{2\frac{1}{5}-1\frac{2}{3}}{\frac{4}{7}}$$ [3 marks]

27. $$\frac{3\frac{1}{3}+2\frac{3}{5}}{2\frac{1}{5}}$$ [4 marks]

28. $$4\frac{1}{5}-\left(1\frac{1}{9}\times 3\frac{}{}\right)$$ [3 marks]

DECIMALS

1. Jun 80

Using a calculator, or otherwise, evaluate

$$\frac{1.5+2.85}{4.66-3.21}$$

2. Jun 81

Find the exact value of $\frac{0.432\times 0.02}{0.024}$

3. Jun 84

a. Evaluate without a calculator

$$\frac{10.02\times 0.14}{0.7\times 50.1}$$

b. Evaluate using a calculator $\sqrt{0.749}$

4. Jun 85

Without using a calculator, calculate the exact value of $\frac{0.28(4-2.95)}{0.7\times 0.14}$

5. Jun 87

a. Find the exact value of

$$2.55\times 6.3-\frac{7.5}{1.25}$$

b. Write your answer correct to one decimal place

6. Jun 86
Without using a calculator calculate the exact value of $\dfrac{26.32+38.8}{13.16-11.56}$

7. Jun 88
Calculate the exact value of
(i) 0.03×1.3
(ii) $6(3-1.47)$

8. Jan 89
Calculate
(i) $\left(1.69\times 10^4\right)^{\frac{1}{2}}$
(ii) $\sqrt{\dfrac{0.09}{400}}$

9. Jan 90
a. Evaluate $\left(\dfrac{1.9\times 10^3}{0.7}\right)^2$
b. Express your answer in standard form.

10. Jun 90
a. Evaluate $\dfrac{0.023}{0.351}$
b. Give your answer to 2 significant figure

11. Jan 92
Evaluate the following
(i) $\dfrac{3.5\times 0.07}{2.5-0.05}$
(ii) $3.2\times 10^4 \div 2.1\times 10^3$
(iii) Give your answers in standard form

12. Jan 93
a. Evaluate $2.43\times 10^3-5.26\times 10^2$
b. Express your answer in standard form

13. Jun 93
Evaluate $\sqrt{0.0004\times 10^{-6}}$, giving your answer in standard form.

14. Jan 94
a. Write the number 64.498 correct to
i. the nearest whole number
ii. three significant figures
iii. two decimal places

b. determine to three significant figures
i. the square root of 13
ii. the reciprocal of 13

c. Express $\left(4\times 10^3\right)\times\left(2\times 10^{-4}\right)$ in standard form.

15. Jun 94
Evaluate $3.7\times 10^2+2.4\times 10^3$, giving your answer in standard form.

16. Jan 95
a. Write 0.36^2 in standard form
b. Express $\dfrac{1}{10}$ of 1% as a decimal.

17. Jun 95
Calculate the value of $0.05181 \div 3.14$ and write your answer
(i) Correct to two decimal places
(ii) Correct to three significant figures
(iii) In standard form

18. Re-sit 95
Write the value of $\sqrt{101.6064}$
(i) exactly
(ii) to 1 decimal place
(iii) to two significant figures
(iv) in standard form

19. Jun 96
Calculate $\dfrac{4.8\times 10^4}{24\times 10^7}$ giving your answer ion standard form.

20. Jun 96
Evaluate $\sqrt{1.073}$, giving your answer to three significant figures.

21. Jan 97
Calculate $0.273 \div 15$ and give your answer
(i) Exactly

(ii) Correct to two decimal places

22. Jun 97

a. Calculate the exact value of
$$\frac{2.8+1.36}{4-2.7}$$

b. Calculate 9.72×12.05, and write your answer
   i. Exactly
   ii. Correct to two decimal places
   iii. Correct to two significant figures
   iv. In standard form

25. Jan 99

a. Calculate the exact value of
$(0.35)^2 - 0.03\times 0.8$

b. Express 0.0345
   i. To two decimal places
   ii. In standard form.

26. Jun 99

Evaluate $\frac{7.021}{6.751}$ and express the answer correct to
   i. 3 decimal places
   ii. 3 significant figures

27. Jan 00

Write 4768 correct to three significant figures

28. Jun 00

Write the following value of 0.428 × 2.75
   i. exactly
   ii. to two significant figures
   iii. in standard form

29. Jun 01

Write 0.8909
   i. in standard form
   ii. correct to two significant figures

30. Jun 02

Write the value of $(11.2)^2 - (0.375 \div 3)$
   i. Exactly
   ii. To two significant figures
   iii. In standard form

31. Jun 03

Using a calculator, or otherwise, determine the exact value of

23. Jan 98

i. Calculate the value of
$\left(4.2\times 10^4\right)\times\left(5\times 10^{-3}\right)$

ii. Write your answer in standard form.

24. Jun 98

Express $\frac{0.0402}{0.71}$
(i) correct to two decimal places
(ii) correct to two significant figures
(iii) in standard form.

i. $(1.7)^2 + (1.3)^2$

ii. $\frac{4.8+6.9}{1.3\times 0.2}$

32. Jun 04

Using a calculator or otherwise, determine the exact value of

i. $2.3^2 + 4.1^2$

ii. $\frac{0.18}{0.6} - .003$

33. Jan 05

Using a calculator or otherwise, determine the exact value of
$\sqrt{\frac{13.5}{0.33}}$

34. G Jan 91

Calculate the exact value of
   a. 0.35 × 0.2
   b. $\frac{1}{0.4}$
   c. $\sqrt{0.0036}$

35. G Jan 91

a. The sun is approximately 150 000 000km from the earth. Write this distance in standard form

b. Bets and Gamma are stars. Beta is 3×10^4km from the earth and Gamma is 6×10^{11}km from the earth.
How many times further from the earth is Beta than Gamma?

SUBSTITUTION

1. June 82
Calculate the value of V in the formula
$V = \pi^2 \left(\frac{R - r^2}{2} \right)^{\frac{1}{3}} (R + r)$
where $R = 22.8$, $r = 7.50$, $\pi = 3.14$ [7 marks]

2. G June 92
Given that $x = 2$, $y = -5$, and $z = 3$, find the value of
   a. $x - 2y$
   b. xz^2
   c. $\frac{7x + 2z}{y}$ [5 marks]

3. G Dec 92
Given that $p = 2$, $q = -3$, and $r = -1$, find the value of
   a. $5p - 2q$
   b. $pq + pr$
   c. pr^2 [5 marks]

4. Jun 94
Given that $a = 4$, $b = -2$, and $c = 3$, calculate the value of $\frac{a^2 - bc}{b + c}$ [2 marks]

5. Jun 97
Given that $m = -3$, $n = 2$, and $p = -1$, find the value of $\frac{m(p - n)^2}{3p + m}$ [4 marks]

6. Jan 00
If $l = -2$, $n = -3$, and $m = 4$, calculate the value of $\frac{m + nl}{n - m}$ [2 marks]

7. Jan 92
Given that a = 4, b = –3, and c = 12, calculate the value of $a^2(2b - c)$ [2 marks]

8. Jun 96
Given that $l = -2$, $m = 3$, and $n = 7$, calculate the value of $lm(m - n)$ [2 marks]

9. Jan 98
Find the value of p, if 3 is a root of
$5x^2 - px - 18 = 0$ [3 marks]

10. Jan 02
If $a = 4$, $b = -2$ and, $c = 3$, calculate the value of $\frac{a(a - b)}{bc}$ [2 marks]

11. June 03
Given that $a = 2$, $b = -3$, and $c = 0$, evaluate
   i. $4a - 2b + 3c$
   ii. a^c [3 marks]

12. Jan 04
If $p = 5$, $q = 0$, and $r = -3$, evaluate
   i. $4p - qr$
   ii. $2r^3$ [3 marks]

13. Jan 05
Given that $r = \frac{2p^2}{q - 3}$, calculate the value of r

when $p = 6$ and $q = 12$ [2 marks]

14. Jun 05

Using the formula $t = \sqrt{\frac{5m}{12n}}$ calculate the value of t when $m = 20$ and $n = 48$

15. Jan 89

Given that $x^2 - y^2 = 144$ and $x + y = 9$, determine the values of

i. $x - y$

ii. $x^2 + Y^2 - 2xy$

16. G Jun 91

Given that $a^2 - b^2 = 96$ and , $a + b = 16$ find the value of $a - b$ [2 marks]

17. G Dec 91

Given that $(x + y) = 7$ and $(x - y) = -3$ find the value of $(x^2 - y^2)$ [2 marks]

18. Jun 97

Given that $4p^2 - 4q^2 = 2r$ and that $p + q = r$, show that $p - q = \frac{1}{2}$

SUBJECT OF THE FORMULA

1. Jun 79

Make p the subject of the formula

$r = \sqrt{\frac{4 + 3p^2}{s}}$ [4 marks]

2. Jun 83

Make R the subject of the formula

$A = \pi\left(\frac{R - r}{2} \div \right)^2$ [4 marks]

3. Jun 84

Given $m = \frac{\sqrt{1 - n^2}}{n}$, express n in terms of m

[5 marks]

4. Jun 86

If $\frac{1}{R} = \frac{1}{v} + \frac{2}{t}$, express t in terms of R and T.

5. Jan 89

Given that $\frac{4}{x} + \frac{3}{y} = \frac{7}{t}$, express t in terms of x and y.

6. Jun 89

Given that $x = \frac{y - 2}{y - 3}$, express y in terms of x.

7. Jan 92

Given that $C = 2\pi r$ and $V = \frac{1}{3}\pi r^2$, express V in terms of C, π, and h, and simplify your answer.

8. Jun 94

Given that $\frac{2x}{3} + \frac{4}{y} = 1$, express y in terms of x.

9. Resit 95

a. Make a the subject of the formula

$b = \frac{3a + 2}{a + 3}$

b. Calculate the value of a when $b = 2$

10. Jun 96

Make y the subject of the formula

$\sqrt{\frac{ym}{t}} = 3b$

11. Jun 96

If $\frac{p}{s} = \frac{q}{s} + r$, express s in terms of p, q and r.

12. Jun 99

Given that $l = \sqrt{\frac{3m}{5}}$, Express m in terms of t

13. Jan 02

If $a = 4$, $b = -2$, and $c = 3$

calculate the value of $\frac{a(b - c)}{bc}$

14. Jan 03
Given that $s - 3t = rt$
   a. Express t in terms of r and s
   b. Calculate the value of t when $r = 2$ and $s = 15$

15. Jan 05
The temperature in degrees Celsius is calculated using the formula
$C = \frac{5}{9}(F - 32)$
Where F is the temperature in degrees Fahrenheit,
   a. Make F the subject of the formula
   b. The temperature in London is $15°C$. use the formula derived in 'a.' above to convert this temperature to degrees Fahrenheit.

16. Jun 04
Express m as the subject of the formula
$t = \sqrt{\frac{5m}{12n}}$

17. Jun 05
Given that $r = \frac{2p^2}{q-3}$
Rearrange the formula to make q the subject.

SIMPLIFYING EXPRESSIONS

Simplifying the following

1. Jun 88
$2(5x - y) - 3(3x - y)$

2. Jan 02
$2(3x + 1) - (x + 2)$

3. Jan 01
$2y + 3(y - 1)$

4. Jun 02
$3m - 2(m + 1)$

5. $-3(3x + 1) - (6x - 3)$

6. Jun 05
Expand and simplify
$(2x + 5)(3x - 4)$

7. Jan 91
$\frac{9x^2 - y^2}{9x + 3y}$

8. Jan 97
$\frac{2x + 3}{5} - \frac{x + 2}{3}$

9. Jan 01
$\frac{3 + 2}{2} - \frac{3}{m}$

10. Jun 04
Express as a single fraction
$\frac{3p}{2} + \frac{p}{q}$

11. Jan 94
$\frac{5}{y} - \frac{7}{y} + \frac{1}{2}$

12. G Jun 91
$\frac{2}{3} + \frac{a - 2}{2a}$

13. Jun 02
$\frac{3}{y} - \frac{2}{y - 2}$

14. Jun 03
$\frac{2}{a - 3} + \frac{3}{a}$

15. Jan 05
Write as a single fraction in its simplest form

$$\frac{3}{x}+\frac{4}{x+1}$$

16. Jan 00

$$\frac{2}{x-1}-\frac{3}{x+1}$$

17. Jan 92

Express as a single fraction

$$\frac{4}{x-1}-\frac{3}{x^2-1}$$

18. Jan 93

$$\frac{2x}{x-3}+\frac{6}{3-x}$$

19. G Jun 92

$$\frac{3}{3t-1}-\frac{2}{2t+1}$$

20. G Dec 92

$$\frac{b}{b-5}-\frac{2}{b+3}$$

21. G Jun 93

$$\frac{1}{p-2}-\frac{2}{4p+3}$$

22. Jan 90

$$\frac{4}{x}+\frac{5}{2x}-\frac{x}{2}$$

Word Problems

23. Jan 97

In a multiple choice test of 30 items, each candidate is given a bonus mark of 30. a candidate earns 3 marks for each correct answer and loses 1 mark for each incorrect or omitted answer.

Assuming that a candidate gets x correct answers, show that the total number of marks received must be divisible by 4

24. G Jun 91

A ticket for an adult visiting an exhibition is x cents.

A ticket for a child costs 30 cents less than the adult's ticket.

i. Write down in terms of x the cost of a child's ticket.

ii. Mr. Smith takes his three children to the exhibition
Find, as simply as possible in terms of x, the total The total cost in cents of the four tickets.

25. Jan 93

i. Alice hat t tapes and Ben has 10 tapes more than Alice.
Express, in terms of t, the number of tapes Ben has.

ii. Alice gives Ben 14 of her tapes. Ben now has twice as many tapes as Alice now has
Write an algebraic expression to represent the amount each person now has

26. Jun 05

Adam, Imran, and Shakeel were playing a card game.
Adam scored x points
Imran scored 3 points fewer than Adam
Shakeel scored twice as many points as Imran
Together they scored 39 points

i. Write down in terms of x an expression for the number of points scored by Shakeel.

ii. Write an equation which may be used to find the value of x.

INDICES

1. Jun 82

a. Simplify $\left(x^{\frac{1}{2}} \div \right)^3 \times \sqrt{x^9}$

b. Find the value of y^6 when $y = 16^{-1}$

2. Jun 84

Simplify the expression $4a^{-\frac{1}{2}}(a^{\frac{5}{2}} - a^{-\frac{3}{2}})$. State your answer using positive indices.

3. Jun 87

Solve the equation $2^{4x} = 64$

4. Jun 88

$81^{\frac{1}{2}} \times 27^{-\frac{1}{3}}$

5. Jun 90

Solve the equation $9^{2x} = \frac{1}{27}$

6. Jan 93

Evaluate $5^3 \times 5^{-2}$

7. Jan 93

Simplify $\left(\frac{27}{8} \div \right)^{\frac{1}{3}}$

8. Jun 99

Evaluate $27^{-\frac{1}{3}} \times 9^{\frac{1}{2}}$

9. Jan 02

$\frac{4c^2 \times 3c^4}{c^3}$

10. Jan 05

Calculate the value of

$9^{\frac{1}{2}} \times 8^{\frac{2}{3}} \times 4^0$

11. G Jun 91

Evaluate

a. $18^3 \div 18^2$

b. 8^0

c. $25^{\frac{3}{2}}$

12. G Dec 92

Evaluate

a. $4^{\frac{3}{2}}$

b. $\left(\frac{5}{3} \div \right)^{-2}$

c. $2^0 \times 2$

13. G Dec 92

Evaluate

a. 5^{-2}

b. $49^{\frac{1}{2}}$

c. $6^{\frac{2}{3}} \times 6^{\frac{2}{3}} \times 6^{\frac{2}{3}}$

14. G Jun 93

Evaluate

a. $15^4 \div 15^3$

b. 6^0

c. $16^{-\frac{1}{2}}$

RATIO, PROPORTION, AND VARIATION

Proportion

1. Jun 79

A sum of money was to be shared among 3 persons A, B, and C in the ratios 2 : 3 : 8, If C receives $120 more than B, find the sum of

money shared.

2. Jun 89
A sum of money was to be divided among A, B, and C in the ratio 2 : 3 : 5. The largest share amounts to $1200.
Calculate
   i. The total sum of money to be shared
   ii. A's share
   iii. The percentage of the total amount that B receives

3. Jun 92
A piece of string 64 cm long is divided in three pieces in the ratio 1 : 2 : 5. Calculate the length of the longest piece.

4. Jan 99
A piece of wood is divided into three pieces in the ratio 3 : 4 : 2. the length of the longest piece is 72 cm. Calculate the length of the piece of wood.

5. Jun 02
A metal is made from copper, zinc, and lead in the ratio 13 : 6 : 1. The mass of zinc is 90 kg. Calculate the mass of the metal.

6. Jun 91
The sum of $2500 is divided among Peter, Queen , and Raymond. Raymond received half, Peter received $312.50, and Queen received the remainder.
Calculate
   i. Raymond's share
   ii. Queen's share
   iii. The ratio in which the $2500 was divided among the three persons.
   iv. The percentage of the total that Peter received

7. Jan 95
Share $150 among John, Mary , and Sarah so that each of the two girls receives twice as much as John.
   i. Calculate the amount of money John received.
   ii. Express John's share as a fraction of the total amount.
   iii. Express Mary's share as a fraction of the total amount received by John and Sarah.

8. G Jun 92
Lilly, Margaret, and Nancy were each left $12000 in their uncle's will.
Lilly decided to spend her money on clothes, holidays, and decorating her flat, in the ratio 4:5:7.
How much did she spend on decorating her flat?

9. G Dec 92
in 1985 Angella and John decided to start a business. Angella invested $240,000 and John invested $160,000.
They agreed that all profits should be divided in the same ratio as the sums of money invested. In 1990 the total profit was $15,000.
   i. How much was John's share of the 1990 profit?

10. G Jun 99
Jason wins $480 with a lottery scratch card. He decides to share his money between his friend Mary and himself in the ratio of 5: 7.
   i. How much money does each receive?
   ii. Jason spends 20% of his share. What percentage of the $480 does Jason now have?

11. G Jun 2000
A coach party travelled to Europe for a holiday. The number of days they spent in France, Spain, and Italy were divided in the ratio 3:4:5. They spent 9 days in France.
   i. How many days was the complete holiday?
   ii. How many days did they spend in Italy?

Equating Ratios

12. Jun 94
The scale used for a map is 1:250000. The distance of *M* from *N* on the map is 4.4 cm. Calculate, in km, the actual distance of *N* from *N*.

13. Jan 00
A scale of 1:15000 is used to draw the map of a city
   i. Calculate the actual distance, in km, between two points in the city which lies 87 cm apart on the map.
   ii. The actual length of the playground in the city is 225 m. Calculate, in cm, the length on the map.
   iii. Given that the area of the playground on the map is 1.8 m^2, calculate the width of the playground as shown on the map

14. G Jun 93

The plan of a garden is drawn to the scale of 1:20.

a. Expressing your answer in cm, calculate the length of the line on the plan which represents a path 13 m long.

b. Expressing your answer in square metres, calculate the area of a pond which is represented on the plan by an area of 125 cm^2

15. Jun 03

A scale of 1: 25000 is used to draw the map of an island. Calculate the distance, in km, between two points on the island if the distance between them on the map is 36 cm

16. Jun 90

Some years ago US$1.00 was equivalent to J$3.50. Calculate the amount in US$ that was equivalent to J$8400.

After devaluation J$1.00 was worth 70% of its original value. Calculate the new rate of exchange for US$1.00 and hence calculate the amount of J$ that would be equivalent to US$2400.

17. Jun 93

The journey to a town along Route A takes 3 hrs by bus OR 1hr. 20min. by car. The journey along Route B takes 1hr. 12min by car.

Calculate the time the bus will take along Route B, assuming that the bus and car travel along Route B at the same rate as along Route A.

Variations

18. Jun 93

Given that y varies inversely as x^2 and that $y = 3$ when $x = 2$, calculate the value of y when $x = 3$.

19. Resit 95

If m varies directly as v^2, and $m = 2$ when $v = 3$, calculate the value of m when $v = 6$.

20. Jun 98

If S varies directly as $(r+1)$, and S = 8 when $r = 3$, calculate the value of r when $S = 20$.

21. Jun 99

Given that q varies directly as p, using the values of p and q in the table, calculate the values of a and b

p	2	8	a
q	6.1	b	1.2

22. Jan 05

Given that y varies inversely as x, use the values of x and y from the following table to calculate the values of a

x	2	32
y	8	a

23. Jun 04

The table below shows corresponding values for p and r

p	m	4	62.5
r	0.2	2	n

Given that p varies directly as r^3, calculate the values of m and n

24. G Jun 91

The cost of printing birthday cards is given by the formula $y = \frac{3000}{x} + k$

where y cents is the cost per card, x is the number of cards printed, and k is a constant.

a. Given that $y = 11$ when $x = 500$, calculate the cost per card when 300 cards are printed

b. How many cards should be printed if the cost per card is to be 7 cents?

Miscellaneous

25. Jun 04

i. Two recipes for making chocolate cake are shown in the table below.

	Cups of Milk	Cups of Chocolate
Recipe A	3	2
Recipe B	2	1

a. What percent of the mixture used in Recipe A is chocolate?

b. By showing suitable calculations, determine which of the two Recipe, A or B, is richer in chocolate.

ii. If the mixture from Recipe A and Recipe B are combined, what is the percent of chocolate in the new mixture?

iii. A vendor makes chocolate drink using Recipe A, 3 cups of milk and 2 cups of chocolate can make 6 bottles of chocolate drink. A cup of milk cost \$0.70 and a cup of chocolate cost \$1.15

a. What is the cost of making 150 bottles of chocolate drink?

b. What should be the selling price of each bottle of chocolate drink to make an overall profit of 20%.

FACTORISATION

1. Jun 87
Factorise completely
$a^2 - ab - ac + bc$

2. Jan 91
Factorise the expression
$6y^2 + 13y - 8$
Hence, or otherwise, solve the equation
$6y^2 + 13y - 8 = 0$

3. Jun 89
Factorise completely
$x^2 - y^2 - 4x + 4y$

4. Jan 89
Factorise
$3a + at - 6p - 2pt$

5. Jun 91
Factorise completely
i. $1 - (a + b)^2$
ii. $(2x^2 + xy - y^2) + 2x - y$

6. G Dec 91
Factorise completely
i. $4x^2 - 8x$
ii. $4y^2 - 8y - 21$

7. Jun 92
Factorise completely
i. $1 - 9x^2$
ii. $3x^2 - 7x - 6$

8. G Jun 91
Factorise $6x^2 + x - 2$

9. Jun 93
Factorise completely $4x^2 - 16$

10. Jan 94
Factorise completely $3x^2 - 21x$
i. $4a^2 - 1$
ii. $6x^2 + x - 2$

11. Jun 94
Factorise completely
i. $9a^2 - b^2$
ii. $3x - 8y - 4xy + 6$

12. Jun 95
Factorise completely
i. $9 - 25m^2$
ii. $2x^2 - x - 15$
iii. $x + y - ax - ay$

13. G Jun 99
Factorise completely
$12p^3q + 8p^2q^3$

14. Jan 95
Factorise completely
i. $6 - a^2$
ii. $5x - xy + 2y - 10$

15. Resit 95
Factorise completely

i. $x^2 - xy$

ii. $e^2 - 1$

iii. $5p^2 - 9pq - 2q^2$

16. Jan 96

Factorise completely

i. $4g^2 - f^2$

ii. $tm - 3t + 2pm - 6p$

17. Jun 96

Factorise completely

i. $8h^2 - 4h$

ii. $4a^2 - 1$

18. Jan 97

i. Factorise $4p^2 - 4q^2$

ii. Given that $4p^2 - 4q^2 = 2r$ and that $p + q = r$, show that $p - q = \frac{1}{2}$

19. Jun 97

Factorise completely

i. $15x^2y - 20xy^2$

ii. $3 - 12b^2$

20. Jan 98

Factorise completely

i. $x^2 + 3x + 2$

ii. $(x + 3)(x - 2) + ax + 3a$

21. Jun 98

Factorise completely

i. $2y^2 + 3y$

ii. $81 - m^2$

iii. $2x^2 - x - 15$

22. Jan 99

Factorise completely $4x^2 - 9$

23. Jun 99

Factorise completely

i. $y^2 - 3y$

ii. $9x^2 - 1$

iii. $8a^2 - 2a - 1$

24. Jan 00

Factorise completely

i. $p^3 - p$

ii. $6nx - 9mx - 4ny + 6my$

25. Jun 00

Factorise completely

i. 3xy-x

ii. $(x - y)^2 - x + y$

iii. $4a^2 - 9$

26. Jan 02

Factorise completely $3pq + q + 6p + 2$

27. Jun 01

Factorise completely

i. $4y^2 + y$

ii. $6x^2 + 13x - 5$

28. Jan 01

Factorise completely

i. $a^2 - 9$

ii. $6ap + 15a - 4p - 10$

29. Jan 03

Factorise completely

i. $4x^2 - y^2$

ii. $6m + 4n - 9km - 6kn$

iii. $2a^2 + a - 6$

30. Jun 03

Factorise completely

i. $7mp^2 + 14m^2p$

ii. $2y^2 - 11y + 15$

31. Jun 04

Simplify

i. $\frac{x^2 - 1}{x - 1}$

ii. $\frac{4ab^2 + 2a^2b}{ab}$

32. Jan 05

Factorise completely

i. $3g - 3t + 2mg - 2mt$

ii. $3x^2 + 2x - 8$

iii. $3x^2 - 27$

33. Jun 05
Factorise completely
i. $5a^2b + ab^2$
ii. $9k^2 - 1$
iii. $2y^2 - 5y + 2$

SIMPLE EQUATIONS

Solve the following equations

1. Jan 92
$5x - 1 = 8x + 1$

2. G Jun 91
$3(x - 2) = 15$

3. G Jun 93
$5(x + 6) = 20$

4. Jun 02
$2(x - 1) = \frac{5}{2}$

5. Jan 94
$5x - 3(x - 1) = 39$

6. Jun 95
$\frac{p-1}{2} - \frac{p-2}{3} = 1$

7. Resit 95
$8x - 2(3x - 8) = 24$

8. Jun 01
$6x - 8(3x - 8) = 24$

9. G Jun 92
$7(2p + 1) - 4(3p + 2) = 0$

10. Jan 02
$2(3x + 1) - (x + 2)$

11. G Jun 93
$\frac{1}{t} + 3 = 5$

12. Jan 01
$\frac{x}{4} + 16 = 2x$

13. Jun 91
$\frac{x}{5} - 5 = \frac{x}{15} + 4$

14. Jun 92
$\frac{2x-1}{2} - \frac{x+5}{3} = 2$

15. Jun 96
$\frac{4x+5}{2} - \frac{9+2x}{3} = 0$

16. Jan 99
$\frac{2x-3}{2} - \frac{x+4}{4} = 1$

17. Jan 03
$\frac{x+2}{2} - \frac{x-1}{3} = 2$

18. Jun 97
$\frac{3x+1}{3} - \frac{x-2}{2} = 2 + \frac{2x-3}{3}$

19. Jun 89
$3\frac{(x-2)}{2} - \frac{x-3}{4} = 4$

Word Problems

20. Jun 90
The ratio of the prices of two different sheets of glass is 2 : 5. The total bill for 20 sheets of the cheaper glass and 10 sheets of the more expensive one is $1080. If *d* represents the cost of one sheet of the cheaper glass, determine

i. An expression in d for the cost of ONE sheet of the more expensive glass.
ii. The value of d.
iii. The cost of ONE sheet of the more expensive glass.

21. Jan 93
Alice has t tapes and Ben has 10 tapes more than Alice
i. Express, in terms of t, the number of tapes Ben has.
Alice gives Ben 14 of her tapes. Ben now has Twice as many tapes as Alice now has.
ii. Write an algebraic equation to represent this new information.
iii. Calculate the value of t

22. Jan 95
A farmer shared 496 tomatoes among her 3 workers, Paula, Greta, and Gertrude. Greta Received 16 more than Paula. Gertrude received three times as many as Paula.
Calculate the number of tomatoes Paula received.

23. Jan 96
The width (w) of a rectangular lawn is 3 metres lass than half its length(l). The perimeter is 42 metres
i. Show that $w + l = 21$
ii. Write an equation for the width (w) in terms of the length (l).
iii. Calculate, in metres, the width (w) of the lawn.

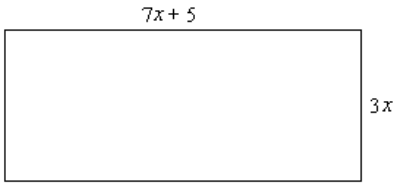
24. Jan 01
In a box there are n red balls and three times as many black balls.
i. Write an expression in n to represent the total number of balls in the box
Eight balls are removed from the box . there are 20 balls remaining
ii. Write an equation to show this
iii. Using your equation calculate the number of black balls in the box at start.

25. Jan 97
A piece of rope 117 cm long is cut into two pieces so that one piece is 27 cm longer than the other.
Calculate the length of the longer piece of rope.

26. Jun 98
90 tickets were sold for a concert. X tickets were sold for \$3.00 each and the rest of tickets for \$4.00 each.
Write an expression in x to represent the number of tickets sold at
i. \$3.00 each
ii. \$4.00 each
iii. If the total sales on all tickets amounted to \$300.00, how many of the tickets costing \$3.00 was sold?

27. G Dec 91
John is x years old and his sister Mary is $(5x-12)$ years old Given that Mary is twice as old as John, write in terms of x an equation connecting their ages and find their ages.

28. G Jun 99
The diagram below shows a rectangle.



The length of the rectangle is $7x+5$ metres. The width of the rectangle is $3x$ metres.
i. If P stands for the Perimeter of the rectangle, what expression in terms of x can be used for P?
ii. If A stands for the Area of the rectangle, what expression in terms of x, can be used for A?

It is known that the Perimeter, P, is 90 metres.

iii. Using this information calculate the Area, A , in square metres of the rectangle.

29. G Jun 00
Barbara buys x CD's at \$6.00 each. She pays for them using a \$50 note and received y dollars in change.
Express y in terms of x.

30. G Jun 93
Alice runs at a rate of 170 metres in 1 minute, and walks at a rate of 90 metres in 1 minute. From the instant she leaves home, Alice takes 6 minutes, by running and walking to reach a bus stop.
Given that she runs for t minutes,
i. Find, in terms of t, expressions for
a. the number of minutes she walks
b. the distance she runs

c. the distance to the bus stop

ii. Given also that the distance to the bus stop is 740 metres, find the value of t.

31. Jun 02

A man travelled a total distance of 8 km in 54 minutes by running and walking. He ran x Km at 10kmph^{-1} and walked the remaining distance at 5kmph^{-1}.

i. Write an expression in x for the time, in hours, that
   a. he ran
   b. he walked

ii. Form an equation in x for the total time in hours spent traveling.
   Use the equation formed to:
   a. Calculate the value of x
   b. Hence, calculate the distance the man walked

32. G Dec 95

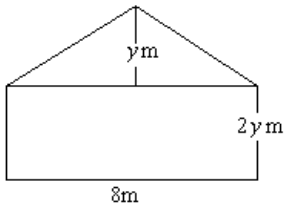
a. An aircraft flew a distance of 3000 km from Berlin to Cairo at an average speed of $v$km/h
   Write down an expression for the time, in hours, that it took for the journey.

b. The aircraft returned nonstop by the same route at an average speed of $2v$km/h
   Write down an expression for the time, in hours, that it took for the return journey.

c. Given that the difference in these two times is 4 hours, form an equation in v and solve it.

33. Jan 05

The diagram below, not drawn to scale, shows the vertical cross section of a shed.



i. Write an expression in terms of y for the area of the figure shown

ii. Calculate the value of y if the area of the figure is 28 m^2

34. Jun 05

Adam, Imran and Shakeel were playing a card game.
Adam scored x points
Imran scored 3 points fewer than Adam
Shakeel scored twice as many points as Imran
Together they scored 39 points

i. Write down, in terms of x, an expression for the number of points scored by Shakeel.

ii. Write an equation which may be used to find the value of x

SIMULTANEOUS EQUATIONS

1. Jun 92
$3x + y = 2$
$4x + 3y = 3$

2. Jun 92
$4x - 4y = 2$
$7x + 2y = 17$

3. Jan 95
$3x - 4y = 32$
$5x + 2y = 10$

4. Jan 02
$2x + 3y = 11$
$4x + 2y = 10$

5. Jun 00
$3a - 2b = 12$
$2a + b = 1$

6. G Jun 91
$3x + 2y = 1$
$4x - y = 16$

7. G Jun 92
$3x + 2y = 8$
$x - 3y = -23$

8. Jan 04
$2x + 3y = 18$
$x + 5y = 23$

9. Jan 91
$3a - \frac{1}{2}b = 4$
$9a + 2b = -2$

10. G Jun 99
$8x + 3y = 35$
$2x - 5y = 3$

11. Jun 86
$\frac{3x}{7} + 2y = 1$
$x - 3y = 10$

12. G Jun 06
$5x + 4y = 6$
$3x - 4y = 10$

Word Problems

13. Jun 87
At a hardware store, 7 chairs and 9 desks cost $1200; 13 chairs and 6 desks cost $1200
   a. Using *c* to represent the cost, in dollars, of one chair and *d* to represent the cost, in dollars, of one desk, write down a pair of simultaneous equations to represent the information above.
   b. Hence, determine
      i. The cost of a chair
      ii. The cost of a desk

14. Jan 90
Mary paid $2100 for four parrots and three dogs. If she had bought one more dog and two fewer parrots, she would have paid $200 more.
Calculate the cost of
   i. a dog
   ii. a parrot

15. Jan 93
The cost of four chairs and a small table is $684. the cost of 6 chairs and a large table is $1196. the cost of the large table is twice the cost of the small table
Given that *a* is the cost, in dollars, of a chair and *b* is the cost in dollars of a small table
   i. Write a pair of simultaneous equation to represent the information given
   ii. Calculate the cost of the large table

16. Jun 99
7 pencils and 5 erasers cost $11.60, whereas 5 pencils and 3 erasers cost $7.60. Calculate the cost of 8 erasers

17. Jun 01
A restaurant bill of $350 was paid using $5.00 notes and $50 notes. The total number of notes used was 16.
Let *x* be the number of $5 notes.
Let *y* be the number of $50 notes.
   i. Write two equations in *x* and *y* to represent the information given.
   ii. Hence, calculate the number of $5 notes and the number of $50 noted.

18. Jun 81
If 5 is added to both the numerator and the denominator of a fraction the result is equivalent to $\frac{3}{4}$, If three is subtracted from both the numerator and the denominator of the original

fraction, the new result is equivalent to $\frac{1}{4}$. Find the original fraction

19. Jan 03
At a school shop, pens are sold for x dollars each and rulers ay y dollars each. Mr. James bought 4 pens and 5 rulers for $24. Mrs. Singh bought 2 of the same pens and 7 of the same rulers for $21.
    i. Write two equations in x and y to represent the information given above.
    ii. Solve the equations
    iii. Calculate the total cost for 1 pen and 1 ruler.

QUADRATIC EQUATIONS

Instruction(s): Solve the following equations.

1. Jun 81
$3(y^2 + 3) = 28y$

2. Jan 90
$(3x - 1)(x + 5) = 4x + 3$

3. Jun 83
$(2x + 3)(x - 7) = 4(x - 7)$

4. Jun 89
$6x^2 + 17x - 14 = 0$

5. G Jun 91
$y^2 + y - 6 = 0$

6. Jun 92
$3x^2 + 5x = 6$

7. Jun 04
$3x^2 - 7x + 2 = 0$

8. Jun 90
$3(x + 2)^2 = 7(x + 2)$

9. Re-sit 95
Show that the roots of the equation $x^2 - 3x + 1 = 0$ are $\frac{3}{2} \pm \frac{1}{2}\sqrt{5}$

10. Jun 87
Show that
$(x + 2)^2 + (x - 3)(x + 3) - 2 \equiv 2x^2 + 4x - 7$

11. Jan 90
Show that
$(x + y + z)^2 - (x + y)^2 \equiv 2(x + y)z + z^2$ for all real values of x, y, and z.

12. Jun 95
If $x = 1$ is the root of the equation $(x - c) = 4(x + c + 2)$. calculate to two decimal places the possible values of the constant c.

13. Jun 05
Show that
$(a - b)^2(a + b) + ab(a + b) = a^3 + b^3$

14. Jan 05
By simplifying, show that
$(2x - 3)(2x + 3) - (x - 4)^2 \equiv 3x^2 + 8x - 25$

15. Jun 85
Find the values of x to two significant figures in the equation $2x^2 + 5x = 9$

16. Jun 88
Calculate correct to one decimal place the values of x for which $2x^2 + 2x - 8 = 3x - 6$

17. G Jun 94
Solve $\frac{9}{u} = \frac{u}{4}$

18. Jun 93
Solve $\frac{2p}{5} + \frac{5}{p} = 3$

19. G Dec 94

$(2x+3)^2 = 25$

20. G Dec 95

$2y^2 = 5y$

21. Jun 03

Given that $m * l = m^2 - lm$

i. evaluate 5*3

ii. Solve for *g* given that $g * 4 = -3$

Word Problems

22. Jun 79

If each side of a square is increased by 3 cm, its area is increased by 45cm^2. Find the length of a side of the original square.

23. Jun 80

Find the values of *a* and *k* such that $x^2 + x + k$ is equal to $(x+a)^2$ for all values of *x*.

24. Jun 80

A square has an area of *A* cm^2, and a perimeter of *P* cm.

Given that $A = \left(x^2 + 2x + 1\right)$, find

a. *P* in terms of *x*

b. The numerical value of *A*, if *A* is also equal to $(11x - 2)$

25. Jun 82

The area of a rectangle is 270 cm^2. If the shorter side was reduced by 2 and the longer side was increased by 4 then the area would increase by 16 cm^2.

26. Jun 83

A BWIA Tri-star jet travels 80 km/h faster than the 747 jet liner. The Tri-star takes 1 hour less than the 747 jet to travel a journey of 6280km. Denoting the speed of the &$& jet liner by *x* km/h

a. Write down an expression in terms of *x* for the time taken for
   i. the 747 jet liner
   ii. the Tri-star jet

b. Form an equation to connect these times and show that it simplifies to $x^2 + 80x - 502400 = 0$

c. Hence, find the speed of both aircrafts to the nearest km/h.

27. Jun 94

i. The width of a rectangular field is *w* meters. The length is 6 meters more than twice the width. Write in terms of *w* an algebraic expression for
   - the length of the field
   - the area of the field

ii. The area of the field is 360 m^2.
   - Write an algebraic equation for the area of the field.
   - Determine the value of *w.*

28. Jun 00

The floor of a room is in the shape of a rectangle. The room is *c* metres long. The width of the room is 2 meters less than its length.

i. State in terms of *c*
   a. the width of the floor
   b. the area of the floor

ii. If the area of the floor is 15 m^2, write down an equation in *c* to show this information.

iii. Use the equation to determine the width of the floor.

29. Jan 89

The side of a square is *x* meters. The length of a rectangle is 5 metres more than the side of the square. The width of the rectangle is 4 metres more than the side of the square.

i. Write, in terms of *x,* expressions for the length and width of the rectangle

The area of the rectangle is 47m^2 more than the area of the square.

ii. Determine the area of the rectangle.

30. G Dec 91

A dealer bought x toys for $27

a. Write an expression, in terms of *x*, for the price, in dollars, he paid for each toy

b. He proposed to sell each toy at a profit of 50¢. Show that his proposed selling price for each toy was $\$\frac{54+x}{2x}$

c. He found that he was only able to sell 8 toys at his price. Write down expressions in terms of *x* for:
   i. the total money , in dollars, he received for the 8 toys
   ii. the number of toys that remained

d. The dealer sold the remaining toys for $2 each. Write down an expression in

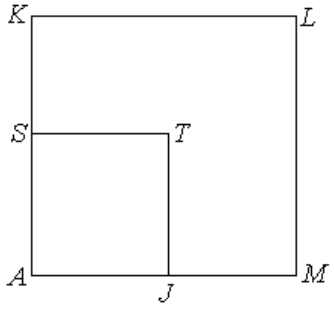
terms of x for the total money, in dollars, he received from them.

e. Given that the dealer received \$30 altogether, form an equation in x and show that it reduces to
$x^2 + 21x + 108 = 0$

f. Solve this equation to find the possible values of x

31. Jun 04

In the diagram below, not drawn to scale, $AKLM$ and $ASTJ$ are both rectangles.



Given that $AS = 3x$ cm, $AJ = 2x$ cm, $SK = 3$ cm and $JM = 5$ cm

i. Obtain an expression in terms of x for the area of rectangle $AKLM$.

ii. Given that the area of rectangle $AKLM$ is 60 cm^2 , show that $2x^2 + 7x - 15 = 0$

iii. Hence calculate the values of x and state the lengths of AK and AM

LINEAR AND NON-LINEAR EQUATIONS

1. Jun 91
$x + y = 5$
$xy = 6$

2. Jan 95
$3x + y = 14$
$2x^2 - xy = 3$

3. Jun 00
$x + 1 = 2y$
$x^2 - 3y = 4$

4. Jan 05
$x^2 = 4 - y$
$x = y + 2$

5. Jun 03
$3p + 2r = 7$
$p^2 - 2r = 11$

6. Jun 95
$x^2 + 9y^2 = 37$
$x - 2y = -3$

7. Jan 99
$2x^2 + y^2 = 33$
$x + y = 3$

8. Jun 00
$x^2 - xy + y^2 = 7$
$2x - y = 5$

9. A Dec 64

$x^2 + xy + y^2 = 2x + 3y = 7$

10. A Dec 88

$\frac{x}{y} + \frac{6y}{x} = 5$

$2y = x - 2$

11. A Jun 96

$\frac{x^2}{6} + \frac{y}{4} = 1$

$x + y = 5$

Word Problem

12. Jun 82

The area of a rectangle is 270 cm^2. if the shorter side was reduced by 2 cm and the longer side increased by 4 cm then the area would be increased by 16 cm^2. Find the lengths of the sides of the original rectangle. [11 marks]

13. Jun 95

Two rectangular plots are equal in area. The length of the first plot is one and a half times its width. The length of the second plot is 7 metres less than three times its width.

a. Denoting the width of the first plot by x and the width of second plot by y, derive a relation between x and y.

b. If $y = x + 1$, calculate the values of x and y. [10 marks]

CONSUMER ARITHMETIC

Simple and Compound Interest

1. June 91

The simple interest on $15000 for 4 years is $8100. calculate the rate percent per annum.

2. Jun 95

The simple interest on a sum of money invested at 3% per annum for 2 years was $39.75. Calculate the sum of money invested.

3. Jun 04

Mr. Mitchell deposited $40 000 in the bank and earned simple interest of 7% for 2 years. Calculate the amount he will receive at the end of the two year period.

4. G Jun 02

Henry opened a bank account with $550. After one year, the bank paid him interest. Henry now had $650 in his account.

a. Work out, as a percentage, the bank's rate of interest.

Gill opened an account at a different bank. The banks rate of interest was 6%. After one year the bank paid Gill interest. The amount in her account was now $2306

b. Calculate the amount of money Gill used to open her account.

5. Jan 98

Anna puts $2500 in the bank and left it for 2 years. At the end of the two years she found that she had $2700. Calculate

i. the simple interest earned

ii. the annual rate percent paid by the bank

6. Jun 99

Pamela borrows $2500 at 12% per annum simple interest for 2 years. In addition, a fee of $200 is charged for processing the loan. Calculate

i. the sum of money which she will have to repay the bank at the end of 2 years.

ii. the profit percent the bank makes on the loan

iii. the monthly installment, if she is required to repay the loan in 24 equal monthly installments.

7. Jun 03
A man deposited $800 in his account at a bank which offers 6% simple interest per annum.

i. How much interest would he receive on the $800 after 9 months?

ii. How long would it take for the $800 to increase to $992?

8. Jan 92
Mary borrowed $3000. at a rate of 8% per annum. Interest is compounded annually. Calculate the total amount owed at the end of two years.

9. Jun 85
$5000 was put in fixed deposit account on January 1, 1984 for 6 months. The rate per annum was 12.5%. On July 1, 1984 the total amount received was invested for a further 6 months at 12% per annum. Calculate the final amount received at the end of the year.

10. Jun 01
A building society offers the rate of 11% per annum simple interest. Beth-Ann deposited $2400 in the society fir 15 months.
i. Calculate the amount of money due to her at the end of this period.
The building society charged her processing fee of $1500.
ii. Calculate this fee as a percentage of the money originally deposited.

Percentages

11. Jan 95
Calculate 15% of 320

12. G Jun 02
i. Find 40% of 6300 m
ii. Calculate the simple interest earned on $5000 invested for 3 years at 8%.

13. G Jun 02
A new Play Station costs $358.20 plus VAT.
VAT is charged at 17.5%
i. How much VAT is paid for a new Play Station?
During a sale the price of the Play Station is reduced by 15%
ii. What is the sale price of the Play Station?

14. G Jun 99
In a room there are 40 people.
26 of these people are women, the rest are men.
What percentage of the people are men?

15. Jan 97
A customer buys a car by trading in his old car at a discount and paying the remainder on the cost of the new car in cash.
i. If he trades in an old car valued at $25 600 at a 10% discount, calculate the amount of money he receives for his car.
ii. Calculate the amount he needs to pay in cash for a new car which costs $85 600.

16. G Jun 05
In a sale the normal prices were reduced by 30%.
Linda bought a mountain bike.
The sale price of the bike was$190. Work out the normal cost of the bike.

17. G Jun 04
Mr. Singh bought a new car for $14 000. Each year the car's value depreciates by 16%.

What will be the value of the car at the end of three years?

18. G Jun 99
Three different shops sell the same television set, the *'Vision 2000'*.

First Shop	Second Shop	Third Shop
$\frac{1}{3}$% off the normal price of $430.	25% off our usual price of $420.	$315 plus VAT at 17.5%

i. What is the cost of a *'Vision 2000'* set in the first shop?
ii. What is the cost of the '*Vision 2000,* set in the second shop?
iii. What is the cost of the *'Vision 2000'* set in the third shop?

19. G Jun 06

This year Bob gets $260 a week for his work. This is 30% more than his weekly pay last year. His friend Danny says – 'That means that you got $182 per week last year.'
Danny is wrong.

a. Explain why Danny is wrong.
b. Calculate Bob's real weekly pay last year.

20. Jun 88

A woman bought a stove for $2800. After using it for 2 years she decided to trade in the stove. The company estimated a depreciation of 15% for the first year of its use and a further 15%, on its reduced value, for the second year.

a. Calculate the value of the stove after the two years.
b. Express the value of the stove after two years as a percentage of the original value.

21. G Dec 91

45% of a baker's total expenses are for the cost of fuel and the remainder is for the cost of material.

a. In 1989, the baker's total expenses were $7000. Calculate the cost of his material in 1989.
b. In 1990, the cost of the fuel increased by 4% and the cost of materials increased by 10 %. Calculate
   i. the increase, in dollars, in the cost of the bakers material
   ii. the percentage increase in his total expenses.

22. G Jun 03

Janette repairs television s.
She charges $51.20 for the first hour and $38.70 for each extra hour's work.
On Tuesday last week, Janette repaired a television and charged a total of $283.40

a. How many hours on Tuesday did Janette spend repairing this television?

If Janette is paid within 3 days she reduces her charges by 6%. Janette was paid the next day for repairing the television.

b. Calculate how much she was paid.

23. G Jun 99

Fiona buys a computer.

She gets a special discount of $\frac{1}{5}$ off the price.

i. Write $\frac{1}{5}$ as a decimal
ii. Write $\frac{1}{5}$ as a percentage
iii. If the computer costs $898, work out what Fiona will pay when she gets the discount.

24. G Jun 99

1 litre = 1.759 pints
1 litre = 10^3 cm^3

i. Use the information above to find how many litres there are in 1 pint. Give your answer correct to 3 significant figures.
ii. A tank of heating oil contains 350 litres of oil. The tank is 70% full.
What is the volume of the tank in cm^3?
Give your answer in standard form.

Profit & Loss

25. G Jun 200

Haley buys 18 bars of chocolate which cost her $5.40. To raise money for charity she sells them at 40 cents each. She manages the sell them all. What is Haley's percentage profit?

26. Jan 94

A merchant sold a radio for $500. he made a profit of 20% on the cost price. Calculate the cost price.

27. Jun 92

A merchant sold a pen for $5.35, thereby making a profit of 7% on the cost to him. Calculate

a. The cost price of the pen to the merchant
b. The selling price the merchant should request in order to make a 15% profit.

28. Jun 00

A company sells its printers to customers in order to make a profit of 25%. Calculate

a. the price a customer pays for a printer which the company bought for$1700.
b. the price the company paid for a printer which was sold to a customer for $2 500.

29. G Jun 03

Miguel bought a new motorbike for $9000. Each year the value of the motorbike depreciates by 10%.

What is the value of Miguel's motorbike 3 years after he bought it?

30. Jan 93

A trader bought 1000 oranges for $500. Eighty of them were bad. She sold the remainder in packets of four at $3.50 per packet. Calculate

i. the total amount she received for the oranges sold

ii. the percentage profit on the amount she paid for the oranges.

31. Jun 05

The table below shows Amanda's shopping bill. Some numbers were removed and replaced with letters.

Items	Quantity	Unit Price ($)	Total Price ($)
Stickers	13	0.49	5.88
T-shirts	3	12.50	*A*
CD's	2	*B*	33.90
Posters	*C*	6.20	31.00
TOTAL			108.28
15% VAT(to the nearest cent)			*D*

i. Calculate the values of *A, B, C,* and *D.*

ii. Amanda sold 6 of the 12 stickers which she had bought at 75 cents each. Show using calculations, whether Amanda made a profit or loss on buying and selling stickers.

Hire Purchase and Installments

32. G Jun 99

Rashid wants to buy a guitar.
The guitar he wants costs $1240. He can't pay this in a lump sum, but he can pay by monthly installments.
He agrees to pay a deposit of 5% of the cost price and then 12 monthly installments of $110 every month.
Work out how much Rashid will pay for the guitar when he pays by monthly installments.

33. Jun 91

The cash price of a stereo set was $1850. The hire purchase price was 20% more than the cash price.

a. Calculate the hire-purchase price

b. Calculate the number of monthly installments needed to buy the stereo on hire-purchase given that a down payment of $500 and monthly installments of $215 each were required.

34. Jun 04

The cash price of a dining room suite with a table and 6 identical chairs is $880.

a. If the price of the table is $250what is the price of each chair?

b. The dining room suite may be bought on hire-purchase with a deposit of $216 plus monthly payments of $35 for a period of 2 years. Calculate

i. The total hire-purchase price of the suite

ii. The extra cost of buying on hire-purchase as a percentage of the cash price.

35. Jan 96

The cash price of a used car is $5800. Mary pays a deposit of 20% on the cost of the car and a bank agrees to lend her the remaining amount.

a. Calculate the amount Mary has to deposit

b. If the bank requires Mary to repay the loan in three equal installments of $1856 each, calculate the total amount Mary pays in installments.

c. Calculate the total amount that Mary would pay for the car.

d. Calculate the percent profit that the bank makes.

36. Jan 00

The hire-purchase price of a refrigerator is $6500. A deposit of $500 is made and the remainder is paid in equal monthly payments of $250.

i. Calculate the number of monthly payments that must be made

ii. If the cash price is $4000, express as a percentage of the cash price, the extra cost of buying on hire purchase.

37. Jan 89

A bank gives $2.70 in EC currency for $1 in US currency.
Given that 1% tax is payable on all foreign exchange transaction, calculate the amount, in EC$, which a tourist receives in exchange for US$1200.00 after paying the tax.

Currency Exchange

38. G Jun 06

Susan went to Canada. She exchanged J$300,000 into CA$. The exchange rate was
J$65.50 = CA$1

a. How many CA$ did she receive?

When Susan returned she changed CA$ 78.20 back to J$. The exchange rate had changed to J$68.35 = 1CA$

b. How many J$ did she receive

While Susan was in Canada the value of the Canadian dollar increased from J$65.50 to J$68.35

c. Work out the percentage increase in the value of the Canadian dollar. (Give your answer correct to 2 decimal places)

39. Jun 87

In November 1985, Mr. Rock took TT$800 in Caricom Traveller's cheques to a bank in Antigua to exchange for EC currency. Half of his amount was in $100 cheques and the other half in $50 cheques. He was given the information shown below:

TT$1.00 = EC $1.125

$\frac{1}{2}$% tax is charged on the total foreign transaction .

EC$0.25 stamp duty is charged for each cheque.

Calculate, in EC currency,

i. The tax Mr. Rock had to pay
ii. The amount Mr. Rock received for TT$800 after paying tax and stamp duty

40. Jun 93

A tourist exchanged US$200.00 for Jamaican currency at a rate of US$1.00 = J$18.81. She has to pay a government tax of 2% of the amount exchanged.

Calculate in Jamaican currency

i. the tax paid
ii. the amount the tourist received

41. Jun 99

Mrs. White bought a computer on I January 1996,at a cost of Barbados $4260.Given that the value of the computer depreciated by 20% each year, calculate, in Barbados dollars, the value of the computer at the end of 1997.

Mrs. White bought a new computer for Barbados $6240. Given that the exchange rate at the time was Barbados $1.92 = US $l.00, calculate, in US dollars, the amount of money she paid for the new computer.

42. Jun 83

A man in Honduras deposited H$10 000 in a fixed deposit account for 2 years at 12% per annum simple interest. At the time he deposited his money, H$I.00 = US$I.20, and at the end of the two years when he withdrew his deposit, H$I.00 = US$l.00. (the US$ did not change in value during the period)

i. Calculate, in H$, the interest he received.
ii. Determine, in US$, the equivalent value of his deposit
iii. Express the amount (in US$) he received at the end of the two years as a percentage of the initial deposit (US$)
iv. If he converts the total amount he received at the end of the two years, would he get more US$ now than for his initial deposit two years earlier? Justify your answer.

43. Jun 90

Some years ago, US$1.00 (one United States dollar) was equivalent to J$3.50 (Three dollars and fifty cents, Jamaican currency). Calculate the amount in US currency that was equivalent to J$8400.

After devaluation J$1.00 was worth 70% of its original value. Calculate the new rate of exchange for US$1.00 and hence calculate the amount of Jamaican dollars that would be equivalent to US$2400

Bills and Taxes

44. Jun 82

In August Ms. John's telephone was calculated on the following information:

Long Distance calls to:	Duration of call in minutes	Fixed charges for 3 minutes or less	Additional charge per minute
Ocean Break	7	$0.70	$0.25
Dell	2	$0.90	$0.35
Zenoand	5	$4.35	$1.71

Monthly rental for the telephone = $25.00

Rebate received on rental for 2 weeks when the telephone was not working = $13.20

Calculate Ms. John's Actual telephone bill for August.

45. Jan 90

At a certain hotel, the cost of an overseas telephone call is made up of time charges, a government tax and a hotel service charge. These are calculated as follows.

Time Charges

Minimum 3 minutes $4.50
Each additional minute or part there of $1.50
Government Tax
50% of time charges
The hotel service charge is 10% of the sum of the time charges and government tax.

Calculate the cost of an overseas call to Dominica lasting $18\frac{1}{2}$ minutes.

46. Jan 05

Kin has two telephones, one is a cellular and the other is a landline. The rates for local calls are shown in the table below.

Rates	Type of Telephone	
	Cellular	Land Line
Monthly Rental Fee	$0	$45
Charge per minute on calls made	85 cents	15 cents

i. In one month calls were made lasting for a total of 1hour and 5 minutes. Show by calculation that the cost for using the landline telephone was less than the cost for using the cellular telephone.
ii. For the month of March, the landline telephone was used, and the bill was 54.60. Calculate the total time, in minutes, for which the calls lasted

47. Jun 84

A household uses 60 cubic metres of water for the first half of 1983. In 1983 water rates for domestic users for a half year were as follows:
$1.05 per m^3 for the first $50m^3$
$1.25 per m^3 for amounts in excess of $50m^3$
50% discount on bills paid within 2 weeks of billing

Calculate the amount the household paid for the half year, assuming that the bill was paid within the two weeks.

48. Jun 97

The charges for electricity are given in the table below.

ITEM	RATE
Rental	$2.00 per month
Energy Charge	15¢ per kWh
Fuel charge	2.05¢ per kWh

The meter reading for the kWh used for December and January were

Previous reading	Present reading
30 November	31 January
05783	06593

A government tax of 15% of the total charges is added to the bill. Calculate
i. the number of kWh units used
ii. the total amount to be paid

49. Jan 01

In a certain country electricity charge is based on the following table

Fixed Charge	Charge per kWh used
$4.00	12 cents

i. Calculate the electricity charges for a customer who used 1003 kWh.

There is a government tax of 15% on the electricity charges.
ii. Calculate the tax on the customer's electricity charges, giving your answer to the nearest cent.
iii. Calculate the total amount paid by the customer.

50. Jun 86

The rates for posting parcels are as follows

Parcels not exceeding 500 g $0.25
Each additional 500g or part there of up to a maximum of 2500g $0.20
Registration fee for registering a parcel $2.50

Calculate the cost of posting

i. An unregistered parcel weighing 1250g
ii. A registered parcel weighing 2 kg.

Wages and Salary

51. Resit 95

A salesman earns a basic wage of $225.00 per week, together with a commission of 4% on all sales. During a four–week period the salesperson's sales were $13 500.00.
Calculate the amount the sales person earns.

52. G Jun 01

James has a Job for which the basic rate is $25 per hour and the overtime rate of pay is $36 per hour.

This week James earned $1377. He worked 7 hours overtime.

a. Calculate the amount he earned at the basic rate.
b. Calculate the number of hours that he worked at the basic rate.
c. James noticed that his earnings of $1377 showed a decrease of 10% of his last week's earnings.
Calculate his earnings last week.

53. Jun 98

i. The basic wage rate for a technician for a 42-hour week is $36.40 per hour.
Calculate the technician's weekly wage.
ii. For overtime work the technician is paid one and a half times the basic hourly rate.
Calculate the technician's total wage for 58 hours of work.
iii. In a new wage agreement the basic rate of payment is $1490.00 for 36 hour of work. Calculate
a. the technician's hourly rate of pay
b. the percentage increase in the hourly rate.

54. Jan 02

Mr. Jones works for a total of $15 per hour for a 40–hour week.

i. If Mr. Jones worked only 40 hours during a particular week, what was his wage for the week?
ii. Mr. Jones' wage for the next week was $960. If overtime is paid at double time, how many hours overtime did he work?

55. Jun 96

The Peters' family consists of Mr. Peters, his wife and two children. Mr. Peters monthly salary is $2800.
Income tax allowance for a year are calculated as follows

Husband	$1000
Wife	$600
Each child	$200

Table showing Tax Rates for a year

Chargeable Income	Rate of Tax
For every dollar of the first $12000	5 cents
For every dollar of the next $8000	15 cents
For every dollar of the next $20000	35 cents

Calculate for Mr. Peters,

i. his salary for the year
ii. his total allowances
iii. his chargeable income
iv. the amount he has to pay as income tax
v. the percent of his salary paid as income tax.

56. Jun 94

Janet's gross salary is $2400 per month. Her tax-free allowances are shown in the table below:

National Insurance	5% of gross salary
Personal Allowances	$3000 per year

Calculate

i. Her gross yearly salary
ii. Her total tax free allowances for the year
iii. Her taxable yearly income

A 10% tax is charged on the first $20000 of taxable income.
A 20% tax is charged on the portion of taxable income above $20000.

iv. Calculate the amount of income tax Janet pays for a year.

Miscellaneous

57. Jun 03

RANDY'S VIDEO CLUB

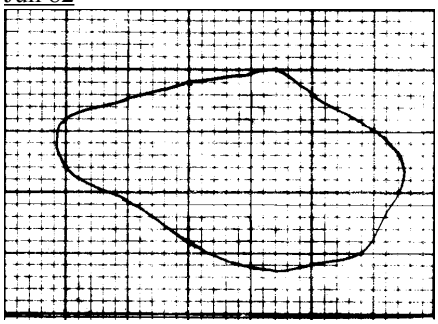
Option A	Option B
Membership fee for one year: $80.00 Rental fee $3.00 per video game	No membership fee Rental fee: $5.00 per video game

a. Carla rents 48 video games during one year. What is the total cost if she chooses:
   i. Option A
   ii. Option B

b. Carla estimates that she will be able to spend $215.00 for renting video games during the next year. How many video games will she be able to rent using:
   i. Option A
   ii. Option B

MENSURATION

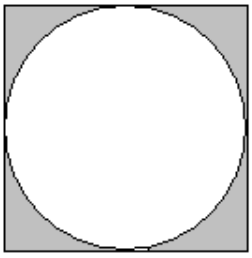
1. Jun 82



The figure above represents a map of the Island Mequi drawn to scale of 1:100 000

a. Estimate in cm^2 the area of the scale drawing.
b. Calculate the actual area of the island in square kilometers giving your answer to two significant figures.
c. State the area of the island in hectares, giving your answer top two significant figures.

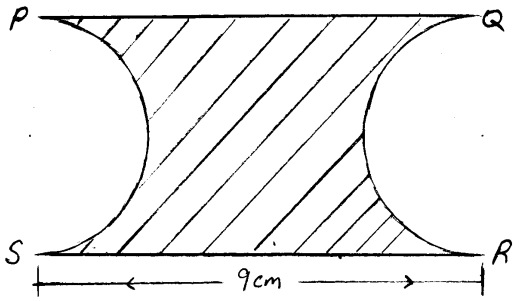
2. Jan 94



The diagram above, not drawn to scale, shows a circle inscribed in a square (take π to be $\frac{22}{7}$)

a. Given that the radius of the circle is 5 cm. calculate
   i. The circumference of the circle
   ii. The perimeter of the square
b. Given that the circumference of the circle is 22 cm, calculate
   i. The area of the circle
   ii. The area of the square
   iii. The area of the shaded region

3. Jan 96



In the figure above, the arcs *PS* and *QR* are semicircles, each of radius 3.5cm, *PQ* = *SR* = 9cm. Take π to be $\frac{22}{7}$. Calculate

i. The perimeter, in cm, of the figure *PQRS*

ii. The area in cm^2 of the *PQRS*

4. Jun 95

In this problem take π to be $\frac{22}{7}$

A piece of wire, formed into a circle, encloses an area of 1386 cm^2.

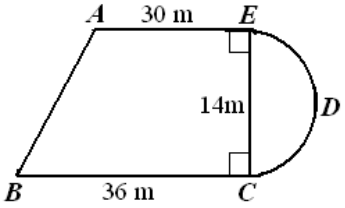
i. Calculate the radius of the circle

ii. Calculate the length of the wire used to form the circle.

iii. The wire is then bent to form a square. Calculate, in cm^2, the area of the square.

5. Jan 92

Use $\pi = \frac{22}{7}$ to answer this question.

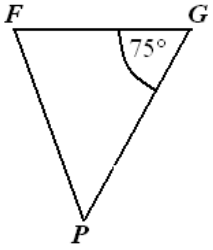


The diagram above, **not drawn to scale,** represents a plot of land in the shape of a trapezium *ABCE* and a semicircle *CDE*. *AE* = 30m, *BC* = 36 m, and *EC* = 14m. *AE* is a perpendicular to *CB*.

i. Calculate, in square metres, the total area of the plot of land.

ii. Calculate to the nearest metre the distance around the entire plot of land.

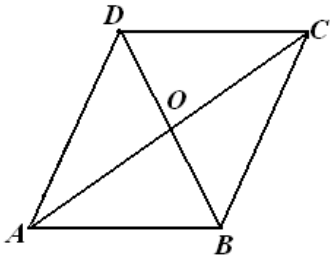
6. Jun 80



In the diagram above, **not drawn to scale**, the two points *F* and *G* are the endpoints of the base of a triangular flower-bed *PEG*, in which $PF = PG = 8$ cm . If $\angle FGP = 75°$, calculate the area of the flower-bed and the length of *FG*.

7. Jun 89

a. State three properties which defines a rhombus with respect to its sides , angles and diagonals.



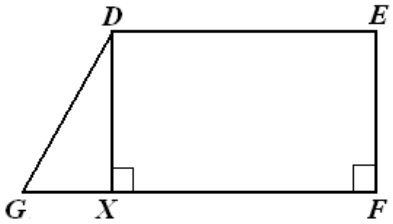
b. *ABCD* is a rhombus, **not drawn to scale**, with *AO* = 4.8 cm and *BO* = 3 cm.
Calculate

i. the length of *AB*

ii. the size of angle *BAD* to the nearest degree.

iii. The area of *ABCD*.

8. Jun 95

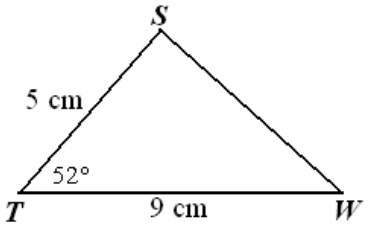


In the trapezium *DEFG* above, **not drawn to scale,** *DE* = 10 cm, *DG* = 13 cm and *GX* = 5 cm. Angle *EFX* and *DXF* are right angles.
Calculate

i. the length of *DX*

ii. the area of trapezium *DEFG*.

9. Jun 02



In the diagram above, **not drawn to scale,** $ST = 5$ cm, $TW = 9$ cm and $STW = 52°$.
Calculate

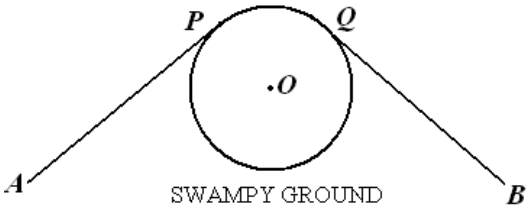
i. the length of SW
ii. the area of $\triangle STW$

10. The area of a parallelogram ABCD is 69 m^2: AB = 9.2m and AD = 8.7m. Calculate the size of angle BAD.

The Circle

11. Jun 79
In a circle, Centre O, AB is a chord of length 12 cm. Given that $\angle BOA = 80°$. Calculate to three significant figures, the area of the minor segment cut off by AB [take $\pi = 3.14$]

12. Jun 80

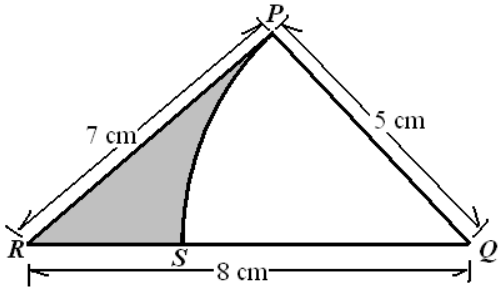


Because of the swampy ground, the path from A to B has to skirt the arc PQ of a circular pond, centre O and radius 14m. The distances from A and B to the nearest point on the pond are both 36 m. the angle $OAB = 30°$
Find in metres the total length of the path APQB, giving the answer correct to 2 significant figures.

13. Jun 83
a chord PQ of a circle of radius 10 cm is 3.16 cm from O the centre of the circle.
Calculate:

a. The size of the angle subtended by the arc PQ at O.
b. The length in cm of the arc PQ
c. The area in cm^2, of the minor sector OPQ.

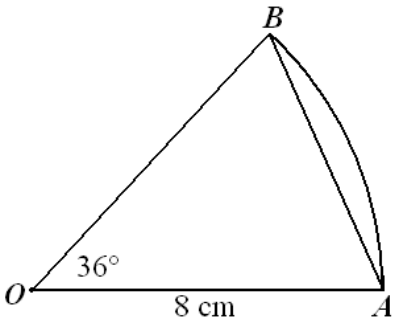
14. Jun 84



In the figure above, **not drawn to scale**, PS is an arc of a circle of radius 5 cm and Q is the centre of the circle , RQ = 8 cm, PR = 7 cm.
Calculate

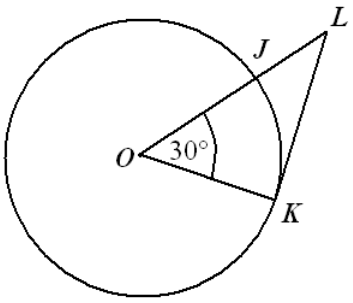
a. The size of angle Q
b. The area of the shaded portion bounded by the arc PS and the line segment PR and RS. (use π=3.14)

15. Jun 86



The figure OAB above, **not drawn to scale,** represents a flower bed in the shape of a sector of a circle centre O, radius 10 m the triangular region OAB is planted in roses and the segment bounded by the chord AB and the arc AB is planted in marigolds.
Given that the angle AOB = 36°, calculate the **area of the segment** assigned to the marigolds.
[Take $\pi = 3.14$]

16. Resit 95

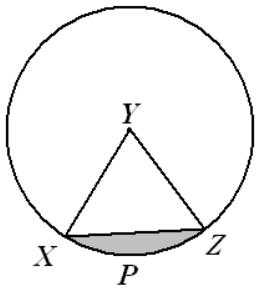


The diagram above, **not drawn to scale**, shows a circle with centre O and two radii, OJ and OK. LK is a tangent to the circle at K. OJL is a sight line; angle KOJ = 3 and OJ = 7 cm.

i. Show that KL = OK tan 30°and hence or otherwise calculate the area , in cm^2, of triangle KOL

ii. Calculate the area, in cm^2, of
   a. the minor sector KOJ
   b. the triangle KOL

17. Jan 91

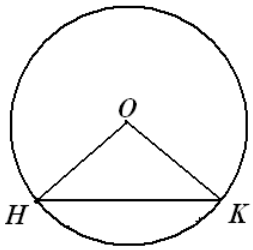


The diagram above, **not drawn to scale**, shows a circle with centre Y, containing an Equilateral triangle XYZ. Given that the radius of the circle is 21 cm, calculate

i. the area of the sector YXPZ
ii. the area of the shaded portion of the circle

18. Jun 92

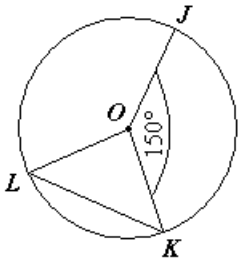
In this question, take π = 3.14



In the figure above, **not drawn to scale**, chord AK subtends angle HOK at O, the centre of the circle. Angle HOK = 120° and OH = 12 cm. Calculate to three significant figures

a. the area of the circle
b. the area of the minor sector OHK
c. the area of the triangle HOK
d. the length of the minor arc HK.

19. Jun 96



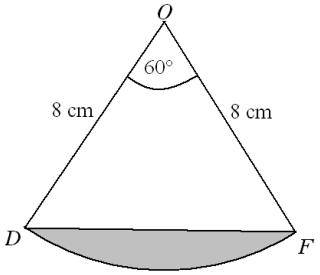
The diagram above, **not drawn to scale**, shows a circle of radius 10 cm, O is the centre of the circle. J, K, and L are points on the circumference of the circle. Angle JOK = 150°. Take π = 3.14.

i. Calculate the length, in cm, of the minor arc JK.

ii. Show that the area of the minor sector OJK is $\frac{125\pi}{3}\text{cm}^2$.

iii. If the area of the triangle LOK is 43.3cm^2, calculate, in degrees, the size of angle LOK.

20. Jan 98

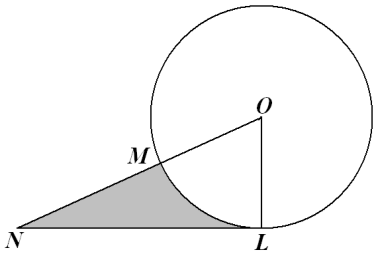


[Take π = 3.14]

The diagram above, **not drawn to scale,** represents a sector, ODF, of a circle centre O, radius 8 cm, and angle DOF = 60°. Calculate, in cm^2, the area of

i. The sector ODF
ii. The triangle ODF
iii. The shaded segment

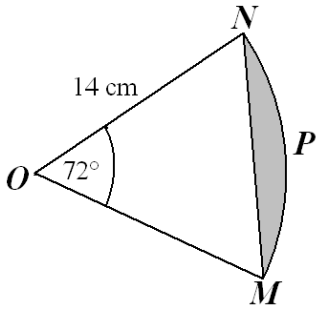
21. Jun 01



The diagram above, **not drawn to scale**, shows a circle centre O, radius 15 cm. the length of the minor arc is 9 cm and LN is a tangent to the circle. OMN is a straight line.

i. Calculate, in radians the size of angle MOL.
ii. Calculate the area of the minor sector OML
iii. Calculate the area of the shaded region.

22. Jan 02



[Take π = 3.14]
In the diagram above, **not drawn to scale**, MPNO is the sector of a circle, with centre O and radius 14 cm. Angle MON is 72°.
Calculate, to 1 decimal place the area of

i. Triangle OMN
ii. The shaded region bounded by the chord MN and the arc MPN.

Volume and Surface Area

23. Jun 80

a. An orange is 9 cm in diameter. If $\frac{2}{9}$ of its juice is 72ml, how much juice can you get from 7 such oranges?

[Volume of a sphere of radius $r = \frac{4}{3}\pi r^3$.

Assume that the orange is a sphere]

b. Two thirds of the juice is poured into a cylindrical container 14 cm high and diameter 7 cm. How many ice-cubes, each of sides 3 cm can be added before the juice begins to overflow?

24. Jun 84

A rectangular wooden beam of length 5 metres has a cross section of 20 cm by 15 cm. the wood has a density of 600 kg per m^3.

a. Calculate the volume of the beam in cubic metres
b. Express the answer for 'a' in standard form.
c. Calculate the mass of the beam in kg.

25. Jun 85

A cylindrical object of height 21 cm has an outer diameter of 28 cm and an inner diameter of 24 cm. The material of which it is made has a density of 6g per cm^3. Calculate, to the nearest kg, the mass of the object

26. Jun 88

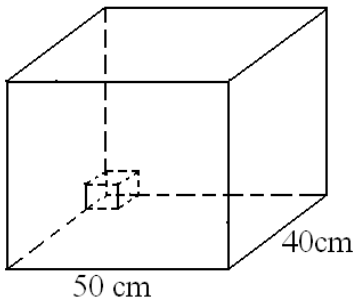
A rectangular steel pyramid of height 6 cm and base dimensions 11 cm by 16 cm, is melted down and rolled into a cylinder of height 7 cm. Calculate

i. the radius of the cylinder in cm.
ii. the mass of the cylinder in kg, if the density of the steel is 5g per cm^3.

(Note: Volume of a pyramid $= \frac{1}{3}Ah$,

Volume of cylinder $= \pi r^2 h$, take $\pi = \frac{22}{7}$)

27. Jan 89

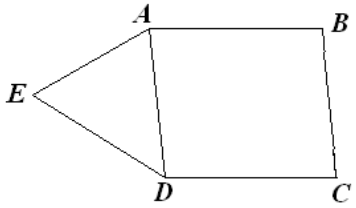


The figure above, **not drawn to scale,** represents a fish tank in the shape of a cuboid of height 30 cm.

i. Calculate the volume of the tank
ii. If there are 40 litres of water in the tank, calculate the height of the water in the tank.

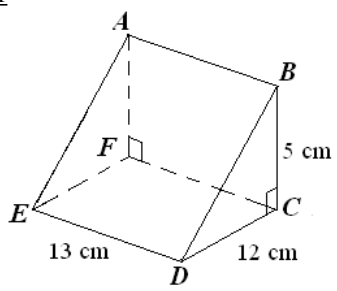
28. The total surface area of a triangular prism is 198×10^5 cm^3, what is its total surface area in m^3

29. Jun 86



The diagram above, **not drawn to scale,** shows a right triangular prism with AB = 15 cm, AD = AE = 10 cm and ED = 12 c. Calculate the volume of the prism.

30. Jun 91



The figure ABCDEF above, **not drawn to scale,** represents a wedge with measurements as shown. BC is perpendicular to the plane FEDC. Calculate

i. the length in cm of BD
ii. the surface area, in cm^2, of the wedge
iii. the volume in cm^3, of the wedge
iv. the size of angle BDC.

31. Jan 91

To answer this question use $\pi = \frac{22}{7}$ and

$V = \pi r^2$, where V = volume, r = radius and h = height of the cylinder.

a. The internal dimensions of a sauce pan shaped like a cylinder height 20 cm and diameter 35 cm. Calculate to the nearest whole number,
   i. the area, in cm^2, of the bottom of the saucepan
   ii. the largest volume of liquid, in cm^3, which the saucepan can hold.

b. The saucepan is filled with water which is then poured into a empty cylindrical pot of radius 21 cm. Calculate, to the nearest cm, the height of the water level above the bottom of the pot.

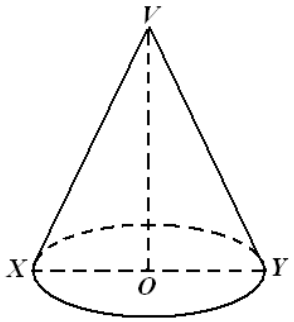
32. Resit 95

A closed cylinder has a base of diameter 14 cm and a vertical height of 20 cm. Take $\pi = \frac{22}{7}$.

Calculate

i. the area, in cm^2, of the base
ii. the volume, in cm^3, of the cylinder
iii. Show that the total surface area is $1188cm^2$.

33. Jun 96



The diagram above, **not drawn to scale,** represents a right open ended paper cone. The slant height VX is 14cm, the base diameter XY is 21 cm and VO is the height of the cone.

[take $\pi = \frac{22}{7}$]

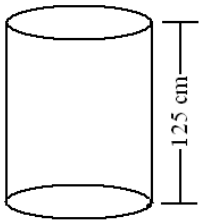
i. Calculate, in cm , the circumference of the base of the cone.
ii. Show that the height of the cone is approximately 9.3 cm.
iii. Calculate the volume in cm^3 of the cone.

34. Jan 97

a. A rectangular tank is 8 m high and its base is 4 m long and 3 m wide. The tank is filled with water.
   Calculate;
   i. the area, in cm^2, of the base of the tank and write your answer in standard form.
   ii. the capacity, in litres, of the tank. Use $100cm^3$ = 1 litre.

b. All the water from the rectangular tank is pumped into a cylindrical tank to a height of 8 m. Calculate to, 3 significant figures, the radius of the base of the cylindrical tank.

35. Jan 99

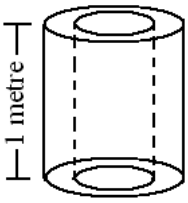


[Take $\pi = \frac{22}{7}$]

i. A cylindrical metal drum of height 125 cm, has a capacity of 693 litres. Calculate the diameter of the drum.

ii. Oil is poured into the drum for 1 hour 17 minutes at a rate of p litres per minute until it just begin to overflow. Calculate the value of p.
[100 cm^3 = 1 litre]

36. Jun 99



A circular drain pipe, shown in the diagram above, **not drawn to scale**, is 1 metre long, with outer and inner radii of 20 cm and 15 cm respectively.

i. Draw a cross-sectional view of the drainpipe, showing the measurement of the inner and outer radii.

Calculate;

ii. the area, in cm^2, of the cross section of the drain pipe.

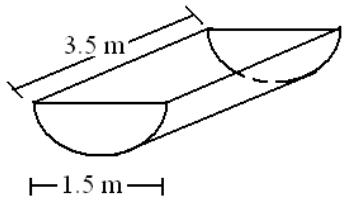
iii. the amount, in cm^3, of the material required to construct the drain pipe.

iv. The capacity, in litres of the hallow space of the drain pipe.

v. The volume, in litres , of water passing through the pipe in 1 minute if the water flows through the pipe at a speed of 1 metre per second

[Take $\pi = 3.14$]

37. Jun 01



[Take $\pi = 3.142$]
[curved surface area of a cylinder = $2\pi rh$]
The diagram above, **not drawn to scale,** represents an open metal container. The cross-section of the container is a semi-circle of diameter 1.5m the length of the container is 3.5m.

a. Write down the radius of the cross section of the container.

b. Calculate in m^2, to two decimal places

i. The area of the cross-section of the container

ii. The outer curved surface area of the container

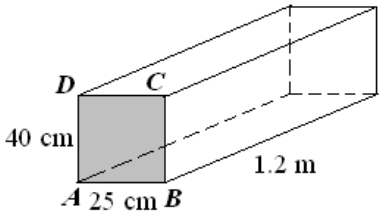
iii. The total outer area of the container

c. Calculate the capacity, in m^3, of the container

d. Water is poured into the container at a rate of 30 litres per minute. Calculate the length of time in minutes it would take to just fill the container.

[**Note: 1m^3=1000*l***]

38. Jan 02



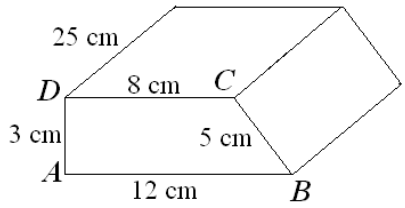
The diagram above, **not drawn to scale**, shows a water tank in the shape of a right prism. AB = 25 cm, AD = 40 cm and the length of the tank is 1.2 m.

Calculate;

i. the volume, in cm^3, of the tank

ii. the depth of water in the tank when it contains 45 litres of water.

39. Jan 03

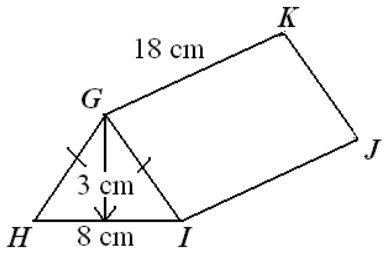


The diagram above, **not drawn to scale,** shows a wooden prism of length 25 cm. the cross section ABCD is a trapezium with AB parallel to DC, $\angle BAD = 90°$, AB = 12 cm, BC = 5 cm, $CD = 8$ cm and AD = 3 cm.
Calculate

i. The area, in cm^2, of the cross-section, ABCD
ii. The volume, in cm^3, of the prism
iii. The total surface area , in cm^2, of the prism.

40. Jan 03

a. The triangular prism, shown the diagram below, **not drawn to scale**, is 18 cm long. Triangle GHI has a height of 3 cm, HI = 8 cm and GH = GI.

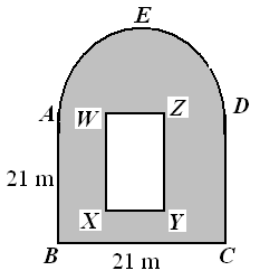


i. The area of triangle GHI
ii. The volume of the triangular prism
iii. The length of GI
iv. The total surface area of the prism.

b. The triangular prism is melted down and made into a cube. Calculate the length of an edge of the cube.

Mixed Shapes and Cross sections

41. Jun 90

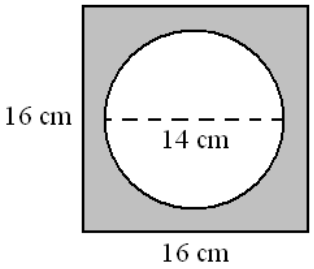


[Take $\pi = \frac{22}{7}$]

The diagram above, **not drawn to scale,** represents a plot of land ***ADCBE*** in the shape of a square of sides 21 m with a semicircle at one end.

i. Calculate, in metres the perimeter of the plot.
ii. ***WXYZ*** is a rectangular flower bed of length 15 m and width 12 m. Calculate in m^2 the area of the shaded section.
iii. The soil in the flower bed is replaced to a depth of 30 cm. calculate in cubic centimetres, the volume of the soil replaced, writing your answer in standard form.

42. Jun 97

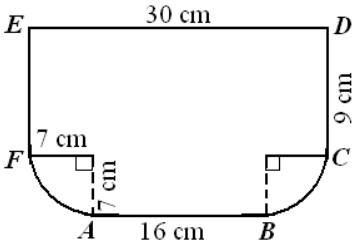


A rectangular block of wood is 6 cm high. The cross-section of the block is a square of side 16 cm. A Cylindrical container is carved out of the block. The cylinder is 5 cm deep and the diameter of the cross section is 14 cm. the figure above, **not drawn to scale,** shows the top surface of the container.
Calculate;

a. the volume of the rectangular block of wood
b. the area of face of the cylinder
c. The volume of the wood in the container.

[use $\pi = \frac{22}{7}$]

43. Jun 02



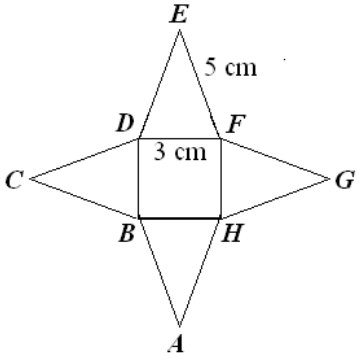
The diagram above, **not drawn to scale,** shows ***ABCDE,*** a vertical cross-section of a container with ***ED*** being the top edge. ***DC*** and ***EF*** are vertical edges. ***BC*** and ***AF*** are arcs of a circle of radius 7 cm, and ***AB*** || ***ED***.
ED = 30cm; ***AB*** = 16 cm; ***EF*** = ***DC*** = 9 cm

i. Taking $\pi = \frac{22}{7}$, show that the area of ***ABCDEF*** is 459 cm^2.

ii. Water is poured into the container until the water level is 4 cm from the top. If the container is 40 cm long and has a uniformed cross-section, calculate to the nearest the volume of water in the container.

Nets Plans and Elevations

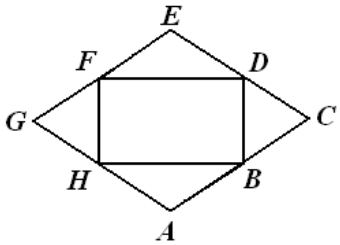
44. Jun 82



i. ***ABCDEFG*** is a sketch of the net of a pyramid on a square base ***BDFH*** of side 3 cm with slant edges of length 5 cm.
   a. Draw an accurate full size diagram of the net.
   b. Measure and write down the length of ***EA***.

ii. The net is assembled as a pyramid with apex ***V*** and base ***BDFH***.
   a. Sketch the cross section ***VDH*** of the pyramid indicating clearly on your sketch the lengths of ***VD*** and ***DH***.
   b. By calculation, determine ***VX*** the height of the pyramid.
   [***X*** is the centre of the base]

45. Jan 90



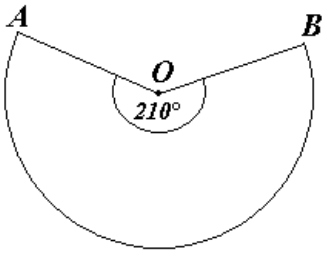
ABCDEFG is the sketch of the net of a right pyramid

46. Jun 93

Notes for this question

Take $\pi = \frac{22}{7}$

Volume of a cone $= \frac{1}{3}\pi r^2 \times h$



The diagram above**, not drawn to scale,** shows a major sector, AOB, of a circle of radius 6 cm. it represents the net of a cone.

a. Show by calculation that the radius of the base of the cone is 22 cm.
b. Calculate:
   i. The radius of the base of the cone
   ii. The height of the cone giving your answer correct to one decimal place
c. Calculate to two significant figures the volume, in litres, the cone holds when filled

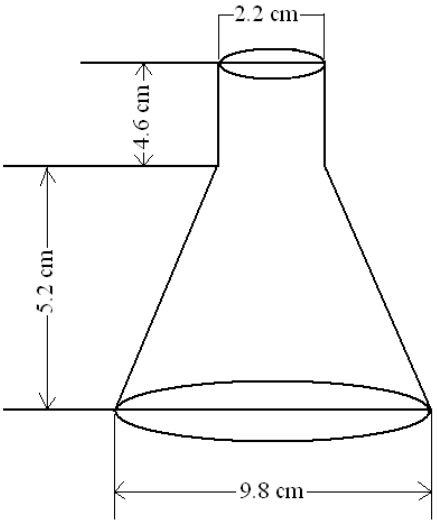
47. Jun 94

VMNPQ is a pyramid on a square base ***MNPQ*** of side 40 cm.

i. Draw a diagram to represent the pyramid. Clearly label the vertices.
ii. Draw a plan of the pyramid, viewed from above. State the scale used.

iii. The height of the pyramid is 20 cm. Show that the length of the sloping edge, VM_1 is $20\sqrt{3}$ cm.

48. Jan 93

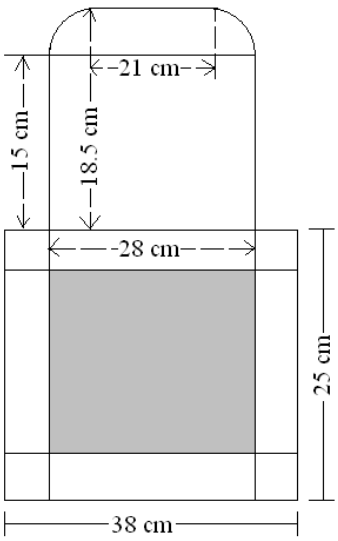


The figure above, **not drawn to scale**, represents a solid in the shape of a right cylinder joined to the frustum of a cone.

Draw

i. the plan of the solid
ii. the elevation of the solid

49. Jan 93

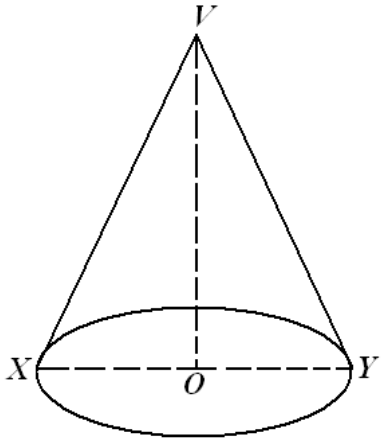


The diagram above not drawn to scale, shows the net of a box in which the sides are 5 cm high. The shaded area is the base of the box.

Calculate to three significant figures

i. the area of the material used to make the box
ii. the volume of the box

50. Jun 96



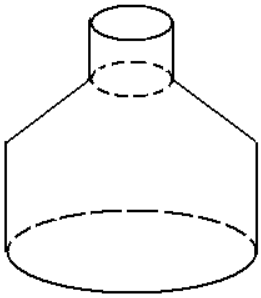
The diagram VXY above, **not drawn to scale,** represents a right open-ended paper cone. The slant height VX is 14 cm, the base diameter XY is 21 cm, and VO is the height of the cone

[Take $\pi = \frac{22}{7}$]

The cone is cut along a straight line drawn from Y to V. the paper is flattened out to form a plane figure.

i. Draw a diagram of the plane figure, showing the position of V.
ii. Write the length of each side on your diagram.
iii. Calculate the size, in degrees, of the angle at V

51. Jun 97

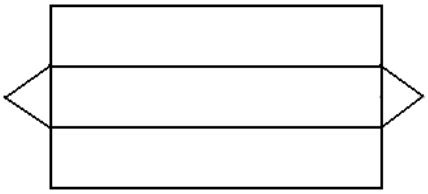


The figure above, **not drawn to scale,** is a sketch of s symmetrical jar. The jar is in the shape of 2 cylinders joined by a frustum of a cone. The diameter of the bottom cylinder is 8 cm and of the top cylinder is 2 cm. The height of each cylinder is 2 cm. The total height of the jar is 8 cm

Construct full size drawings of

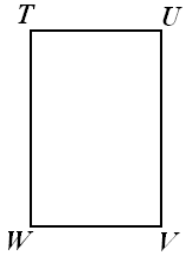
i. the plan
ii. an elevation

52. Jan 99



53. The diagram above represents the net of a solid.
    a. Draw a sketch of the solid represented.
    b. Write down the number of edges for the solid
    c. State the name of the solid.

54. Jun 98



For this question use $\pi = \frac{22}{7}$

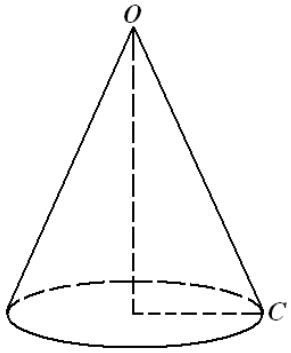
The rectangle, TUVW, represents a sheet of metal, whose length UV is 100 cm and its breadth, WV, is 88 cm. the sheet of metal is formed in an open cylinder, by bringing T onto U and V onto W.

    a. Sketch a diagram of the cylinder and clearly mark in 100 cm as a dimension of the cylinder
    b. Calculate the radius, in cm, of the base of the cylinder.
    c. If the cylinder is closed at one end, calculate, in cm^3, the capacity of the cylinder.
    d. If 50 litres of liquid is poured into the cylinder, calculate, in cm, the depth of the liquid in the cylinder.

55. The distance around a circular lake is 1421 metres. What is the area of the lake?

[Take $\pi = \frac{22}{7}$]

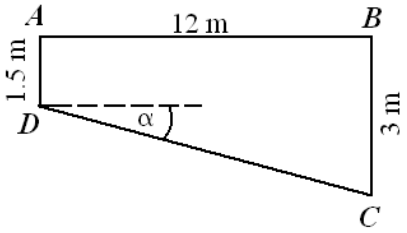
56. Jun 98



The diagram above represents a right circular cone with a base radius of 9 cm and a slant height of 15 cm. The cone is cut along OC, and unrolled to form a sector OCC', from a circle of centre O.
[Take π to be 3.14]
Calculate

    i. the length in cm of the arc CC'
    ii. the size of the angle COC' subtended by the arc CC'
    iii. the area, in cm^2, of the curved surface of the cone.

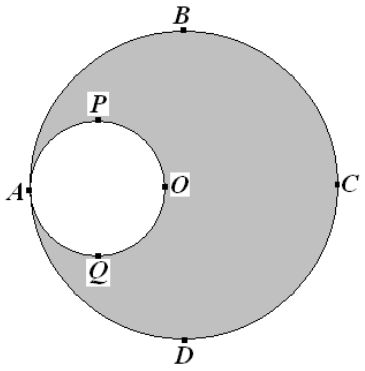
57. Jan 01



The figure above, **not drawn to scale,** shows the cross-section ABCD of a swimming pool, 12 m long. AB is the horizontal top edge, AD shows the depth at the shallow end and BC the depth at the deep end.

    a. Calculate giving the answer correct to 1decimal place,
        i. a, the angle that DC makes with the horizontal
        ii. the length of the sloping edge
    b. Given that the pool is 5 m wide, calculate the total surface of the inner walls and the bottom of the pool

58. G Jun 93



ABC and D lie in a circle, centre O, of radius 14 cm.
AO is a diameter of a circle through A, P, O, and Q

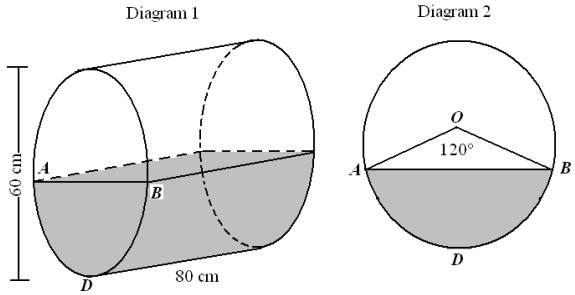
a. Write down the radius of the circle APOQ

b. Take π to be $\frac{22}{7}$, calculate

i. the area of the shaded region

ii. the total length of the boundary of the shaded region

59. Jun 91



In this question take π to be 3.142.

Diagram 1 shows a cylindrical tank of diameter 60 cm and length 80 cm. the tank is partially filled with water and placed with its curved surface on a horizontal floor.

Diagram 2 shows a circular end of the cylinder, O is the centre of the circle and D is vertically below O. The chord AB represents the level of the water surface and $\angle AOB = 120°$

Calculate

a. the length of the arc ADB

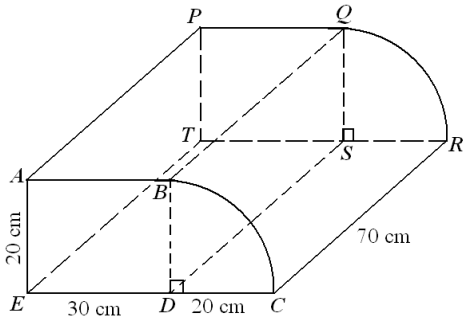
b. the area of the triangle OAB

c. the area of the segment ADB (the shaded part in diagram 2)

d. the area of the inside surface of the tank which is in contact with the water

60. Dec 91

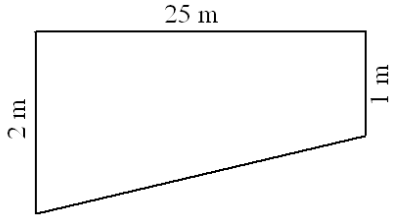
A closed storage container consists of a cuboid ABDEPQST, to which a quadrant of a cylinder, BCDQRS, is attached as shown in the diagram. AE = 20 cm, ED = 30 cm, DC = 20 cm, and CR = 70 cm. Taking π to be 3.142, and giving each answer to 3 significant figures, calculate



a. the area of the face ABCDE

b. the volume of the container

61. Dec 92



The diagram shows the cross section of a swimming pool. The pool is 25 m long, 1 m deep at one end and 2 m deep at the other end. The bottom slopes uniformly from one end to the other.

Water enters the pool at a constant rate and from empty, the time taken to fill the pool completely is 3 hours.

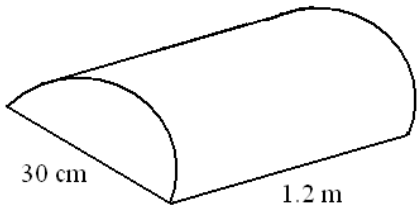
a. Find the area of the cross-section of the pool

b. Find the time taken to fill the pool to the depth of 1 metre at the deep end

c. Find the depth of the water at the deep end after 2 hours

62. Jan 04

The diagram below, **not drawn to scale,** shows a block of wood in the shape of a semi-circular prism. The cross section of the prism has a diameter of 30 cm. The length of the prism is 1.2 metres.



[Use $\pi = 3.14$]

Calculate, giving your answer to 3 significant figures

i. the area in cm^2, of the cross section

ii. the volume, in cm^3, of the prism.

63. Jun 04

[Use $\pi = \frac{22}{7}$ in this question]

A piece of wire is bent in the form of a circle and it encloses an area of 154 cm^2.

a. Calculate

i. the radius of the circle

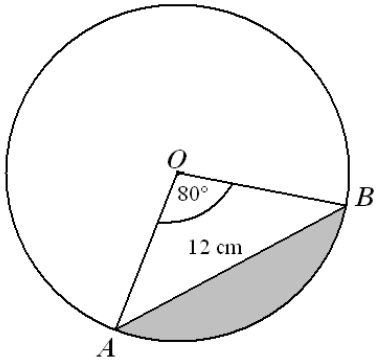
ii. the circumference of the circle

The same piece of wire is then bent in the form of a square

b. Calculate the area enclosed by the square.

64. Jan 04

In the diagram below, **not drawn to scale,** O is the centre of the circle. Angle AOB = 80° and AB = 12 cm.



Calculate, giving your answer to two decimal places

i. the radius of the circle

ii. the area of the minor sector AOB

iii. the area of the shaded region

FUNCTIONS

1. Jun 83

Given that $f(x) = \frac{x+1}{2x-5}$, $g(x) = \frac{2x-5}{x+1}$,

$h(x) = \frac{5x+1}{2x-1}$

i. Evaluate $f(3)$ and $g(4)$

ii. Show that $hf(3) = 3$

iii. Write down the expression for f^{-1}

2. Jun 87

The function $g(x) = \frac{x+1}{x-1}$

i. Calculate $g(\frac{1}{2})$

ii. Given that $g^2(x) = g[g(x)]$ and $g^3(x) = g[g^2(x)]$ and so on, show that $g^2(x) = x$ and hence deduce the value of $g^{21}(\frac{1}{2})$

3. Jun 88

Given that $f: x \to \frac{2x-3}{x+1}$, $g :\to x+2$

i. Evaluate $f(-2)$ and $gf(-2)$

ii. determine $f^{-1}(x)$

iii. Calculate the value of x, for which

a. $f(x) = 0$

b. $f(x)$ is unidentified.

4. Jan 89

Given that $f: x \to 3x-2$, $g: x \to 2x+5$,

$h: x \to \frac{2x+3}{x-1}$

a. Evaluate

i. $g(-6)$

ii. $fg(3)$

b. If $f(x) = 8$, calculate the value of x.

c. Obtain an expression, in terms of x, for $h^{-1}(x)$

5. Jun 89

Given that $f(x) = 5x$ and $g(x) = x - 2$,

i. calculate $f(2)$ and $gf(2)$

ii. determine x when $fg(x) = 0$

iii. prove that $(gf)^{-1}23 = 5$

6. Jan 90

Given that $f : x \to \frac{x^2 - 14}{5x}$ and $x \neq 0$

i. calculate $f(-4)$

ii. obtain an expression for $fg(x)$ if $g : x \to x - 1$

7. Jan 91

a. Given $f : x \to 3x + 7$ and $g : x \to \frac{4x}{5} - 9$, calculate $fg(10)$

b. Given that $h : x \to \frac{3x-1}{x+5}$ for $x \in \mathbb{I}$,

i. State the value of x for which

a. $h(x) = 0$

b. $h(x)$ is unidentified.

ii. determine $h^{-1}(x)$

Hence, solve the equation $\frac{3x-1}{x+2} = 2$

8. Jan 92

The functions f, g and h are defined as follows

$f : x \to x - 3$

$g : x \to x^2$

$h : x \to x^2 - 6x + 9$

a. Given that $f^2(x) = f[f(x)]$ and $f^3(x) = f[f^2(x)]$ and so on,

i. Deduce an algebraic expression in terms of x, for $f^4(x)$ and hence, calculate $f^4(3)$.

ii. Show that $gf(x) = h(x)$

b. i. Determine the range values of $h(x)$ such that $h(x) > 1$

ii. Show that if $h(x) < 25$, then $-2 < x < 8$

c. Hence or otherwise, for $x \in \mathbb{I}$, determine the range of values of x for which $1 < h(x) < 25$ and represent your answer on a number line.

9. Jun 91

The functions f and g are defined by:

$f : x \to 5 + x$

$g : x \to x^3$

Determine expressions for the functions:

i. $fg(x)$

ii. $g^{-1}(x)$

10. Jan 93

Determine the inverse of the functions

i. $f : x \to 2x + 5$

ii. $g : x \to \frac{x-4}{3x}$

11. Jan 93

The functions f and g are defines by:

$f : x \to x^3$

$g : x \to px + q$

a. Determine the value of x if $f(x) = -64$

b. Given $g(0) = -5$, and $fg(2) = -8$, calculate the values of p and q.

c. Given that $-8 < fg(x) < 27$, determine the domain of x:

i. If x is a real number

ii. If x is an integer

12. Jun 93

a composite function K is defines as

$k(x) = (2x - 1)^2$

i. Express $k(x)$ as $gf(x)$, where $f(x)$ and $g(x)$ are two simpler functions

ii. Show that $k^{-1}(x) = f^{-1}g^{-1}(x)$

13. Jan 95

The functions f and g are defined as follows

$f(x) = 2x^2 - 5,\ x \in \mathbb{I}$

$g(x) = 3x - 2,\ x \in \mathbb{I}$

a. Evaluate

i. $f(-3)$

ii. $gf(-3)$

b. Write an expression for $g^{-1}(x)$

c. Determine the value of x for which $g^{-1}(x) = 4$

d. Write an expression for $gf(x)$

14. Jun 95

Given that $f(x) = \frac{1}{2}x,$ and $g(x) = x - 2$ calculate

i. $g(-2)$

ii. $fg(4)$

iii. $f^{-1}(4)$

15. Resit 95

Given that $f(x) = 4 - 5x$ and $g(x) = x^2 + 1$, calculate

i. $f(-2)$

ii. $gf(-1)$

iii. $f^{-1}(4)$

16. Jan 96

Given that $h(x) = \frac{x^2 - 16}{x - 2}$, calculate

i. $h(-2)$

ii. the value of x for which $h(x) = 0$

17. Jun 96

If $f(x) = 2x - 1$ and $g(x) = \frac{1}{2}(x + 2)$, calculate

i. $f(3)$

ii. $g^{-1}(x)$

iii. $gf(3)$

18. Jan 97

Given that $f(x) = x^2 + 3,$ and $g(x) = \frac{x}{2}$, find

i. the values of $f(3),\ g(2),$ and $fg(2)$

ii. expressions for $fg(x)$ and $gf(x)$

19. Jun 97

f and g are functions defined as follows:

$f : x \to 3x - 5$

$g : x \to \frac{1}{2}x$

a. Calculate the value of $f(-3)$

b. Write expressions for

i. $f^{-1}(x)$

ii. $g^{-1}(x)$

c. Hence, or otherwise, write an expression for $(gf)^{-1}(x)$

20. Jan 98

Given $f(x) = 3x - 2$

i. Determine $f^{-1}(x)$

ii. Hence, solve the equation $3x - 2 = 4$

21. Jun 98

Given $f(x) = x^2$ and $g(x) = 5x + 3$, calculate

i. $f(-2)$

ii. $gf(-2)$

iii. $g^{-1}(x)$

22. Jan 99

Given that $f(x) = 2x - 3$

i. Determine an expression for $f^{-1}(x)$

ii. Hence, or otherwise, calculate the value of x for which $f(x) = 7$

23. Jun 99

If $h(x) = 1 + 3x$ and $k(x) = x + 2$, calculate

i. $hk(x)$

ii. $hk(4)$

iii. $(hk)^{-1}(x)$

iv. the value of x when $hk(x) = 0$

24. Jan 00

The function $f : x \to \frac{1}{2}x - 1$

i. Find the value of $f(0)$

ii. Find the value of x for which $f(x) = -5$

25. Jun 00

Given that

$f : x \to 3 - x$

$g : x \to \frac{x + 2}{x - 5}$

a. Calculate $g(2)$

b. State the value of x for which $g(x)$ is not defined

c. Derive an expression for $gf(x)$

d. Calculate the value of $f^{-1}(4)$

26. Jan 01

Given that $f(x) = x + 2$ and $g(x) = \frac{3}{x}$,

i. calculate $f(-1)$

ii. write an expression for $gf(x)$

iii. calculate the values ox x so that $f(x) = g(x)$

27. Jun 01

Given that $g(x) = x + 3$ and $h(x) = x^2$, calculate

i. $g(-5)$

ii. $g^{-1}(7)$

iii. $hg(0)$

28. Jan 02

Given that $f(x) = 9 - x,$ and $g(x) = x^2$,

calculate

i. $f(3)$

ii. $g(-4)$

iii. $fg(2)$

29. Jun 02

The functions f and g are defined by

$f(x) = \frac{x}{3} + 1$

$g(x) = 2x - 1$

a. Calculate $g(-3)$

b. Find in its simplest form

i. $f^{-1}(x)$

ii. $g^{-1}(x)$

iii. $fg(x)$

iv. $(fg)^{-1}(x)$

c. Show that $(fg)^{-1}(x) = g^{-1}f^{-1}(x)$

30. Jan 03

Given that $g(x) = 6 - x$ and $h(x) = x^3$

i. $h(-3)$

ii. $hg(2)$

iii. $gh(2)$

31. Jun 03

Two functions g and h are defined as

$g : x \to \frac{2x+3}{x-4}$ and $h : x \to \frac{1}{x}$

Calculate

i. the value of $g(7)$

ii. the value for which $g(x) = 6$

Write expressions for

iii. $hg(x)$

iv. $g^{-1}(x)$

32. Jan 04

Given that $f(x) = 3x + 4$ and $g(x) = \sqrt{x}$,

calculate

i. $g(25)$

ii. $gf(15)$

33. Jan 05

Te functions f and g are such that

$f(x) = \frac{2x+5}{x-4}$ and $g(x) = 2x - 3$.

Calculate the value of

i. $g(4)$

ii. $fg(2)$

iii. $g^{-1}(7)$

34. Jun 05

The functions f and g are defined by

$f(x) = \frac{1}{2}x + 5 \qquad g(x) = x^2$

Evaluate

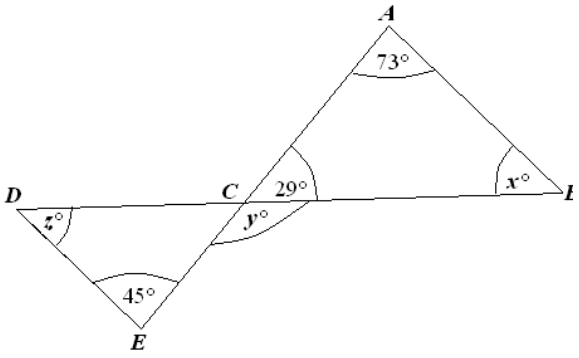
i. $g(3) + g(-3)$

ii. $f^{-1}(6)$

iii. $fg(2)$

SIMPLE GEOMETRY

1. In the diagram below *ACE* and *BCD* are straight lines.

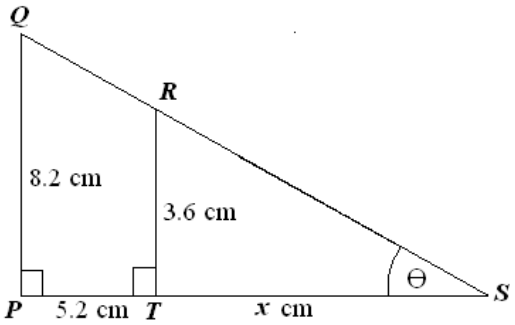


i. Calculate the value of the angle marked $x°$

ii. Calculate the value of the angle marked $y°$.

iii. Calculate the value of the angle marked $z°$.
[**Give two reasons for your answers**.]

2. In the diagram below *PQR* is a right angled triangle. *PQ* is parallel to *TR*.
PQ is 8.2 cm *PT* is 5.2 cm
TR is 3.6 cm *TS* is *x* cm

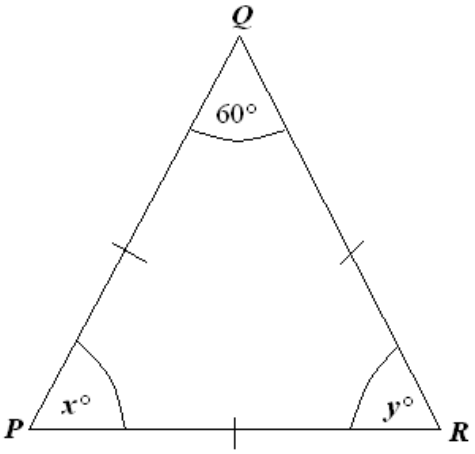


i. What is the area of the trapezium *PQRT*?

ii. Find *x* which is the distance *TS*.

iii. Find tan θ.

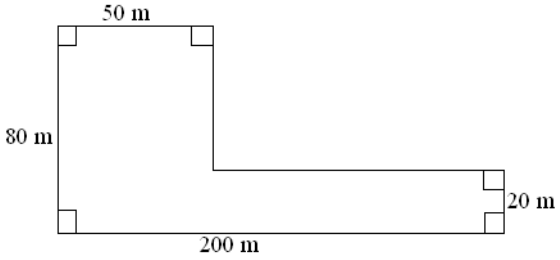
3. In the triangle *PQR* shown below, *PQ* = *QR* and *QR* = *PR*.



i. What is the name of this type of triangle?

ii. What are the values of the angles marked $x°$ and $y°$?

4. Below is the plan of a farmer's field.



What is the total area of the field?
Give your answer with the correct units

5. Use a ruler, a pencil, and a pair of compass only for this question.

i. Draw a line segment, *PQ*, 7 cm long.

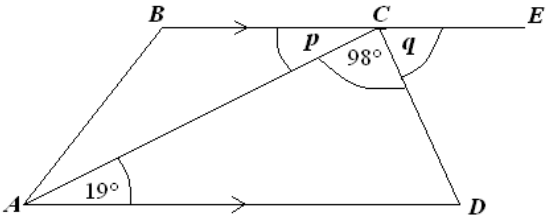
ii. Construct a line segment, *LM*, the perpendicular bisector of *PQ*, such that *LM* cuts *PQ* at *O*, and *OL* = *OM* = cm.

iii. Form a parallelogram *PLQM* by joining the points *P, L, Q* and *M*.

iv. Measure and state the size of angle *MPL*.

v. What type of parallelogram is *PLQM*? Give a reason for your answer.

6. The shape *ABCD* below is a trapezium.

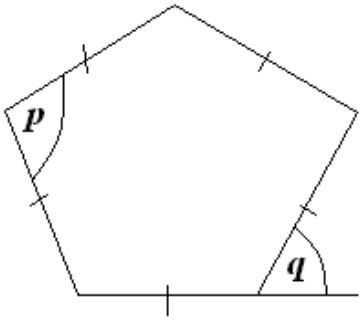


The angle *CAD* is 19°.
The angle *ACD* is 98°.
BCE is a straight line.

i. What is the size of the angle marked with the letter *p*?
Give a reason for your answer.

ii. What is the size of the angle marked with the letter *q*?
Give a reason for your answer.

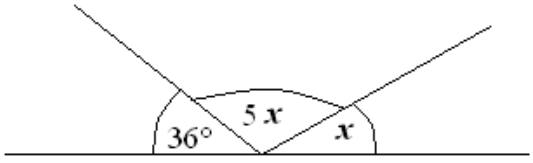
7. Below is the diagram (not drawn to scale) of a regular pentagon.



i. Calculate the value of the angle marked *q*.

ii. Calculate the value of the angle marked *p*.

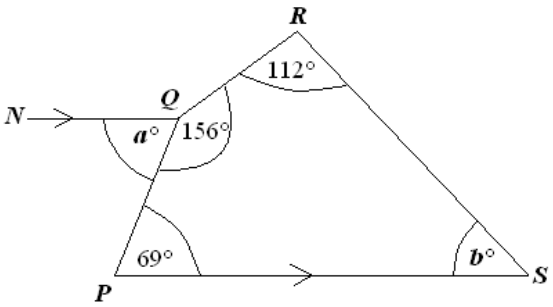
8. Fins the value of *x* in the diagram below.



9. Two angles are supplementary, if one of the angles is twice the measure of the other, what is the measure of both angles?

10. An exterior angle on a regular polygon measures 36°. How many sides does the polygon have?

11. The diagram below shows the quadrilateral *PQRS*.

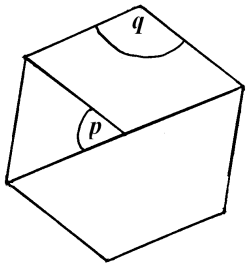


NQ is a straight line parallel to *PS*.

i. What is the size of the angle marked *a*?
Give a reason for your answer.

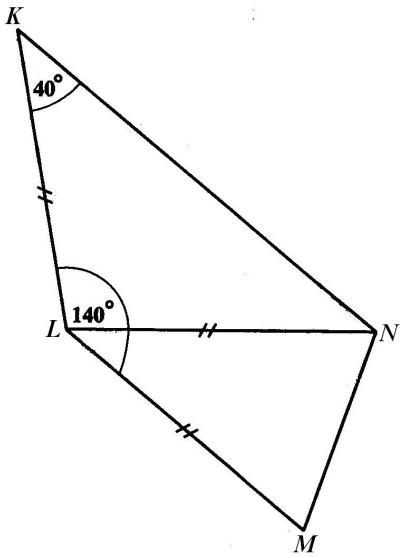
ii. Work out the size of the angle marked *b*.
What property did you use to come up with your solution?

12. Inside the regular hexagon below is an equilateral triangle, a rhombus and a trapezium.



a. What is the size of angle *p*?
b. What is the size of angle *q*?
c. The area of the equilateral triangle is $5cm^2$. Work out the total area of the regular hexagon.
d. By using a ruler and a pair of compass construct an equilateral triangle with sides 5 cm.
(**Leave all construction lines on your diagram**.)

13. In the quadrilateral KLMN, not drawn to scale, $LM = LN = LK$, $\angle KLM = 140°$



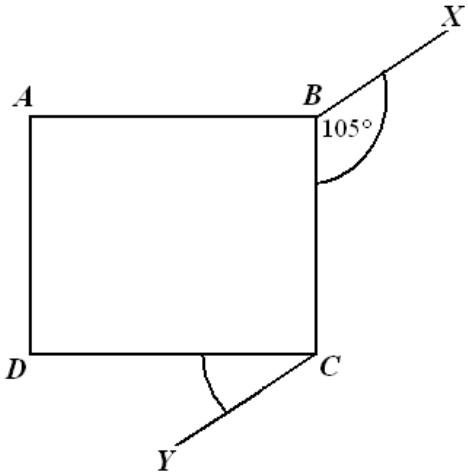
Giving reasons for each step of your answer, calculate the size of

i. $\angle LNK$

ii. $\angle NLM$

iii. $\angle KNM$

14. In the diagram, below ABCD is a rectangle.



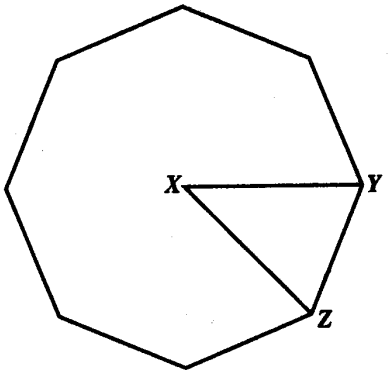
What is the measure of

i. $\angle DCY$

ii. $\angle ABX$

15. A regular polygon has an external angle of 90°. What type of a polygon is it.

16. The figure below, not drawn to scale, is a regular hexagon with centre *X,* and $XY = 6$ cm.



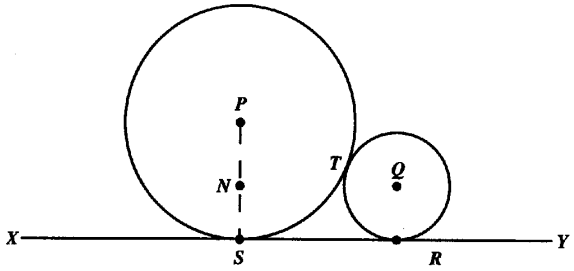
Calculate

i. the size of angle *YZX*

ii. the area of triangle *YXZ*, expressing your answer correct to one decimal place.

iii. the area of the hexagon.

17. Two circles with centres *P* and *Q* and radii 5 cm and 2 cm respectively are drawn so that they touch each other at *T* and a straight line *XY* at *S* and *R*.



a. State with a reason

i. why *PTQ* is a straight line

ii. the length *PQ*

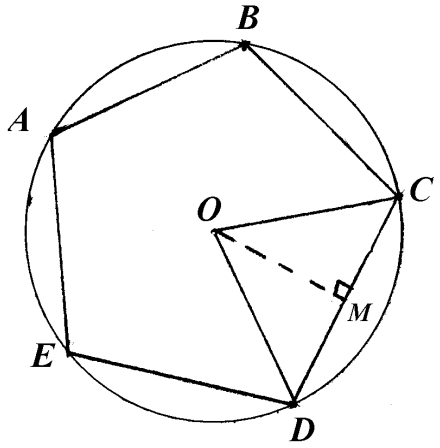
iii. why *PS* is parallel to *QR*

b. N is a point on *PS* such that *QN* is perpendicular to *PS*.
Calculate

i. The length *PN*

ii. The length *RS*.

18. Jun 95



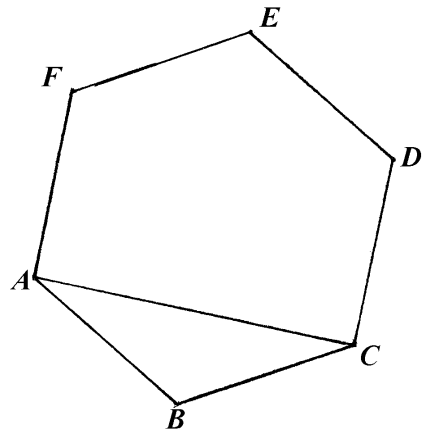
ABCDE is a regular pentagon inscribed in a circle centre *O*, radius 12 cm, as shown in the diagram above, M is the midpoint of *DC*

i. Calculate the angle *DOC* (in degrees)

ii. Calculate *DM*

iii. Hence find the perimeter of the pentagon

19. Jan 89

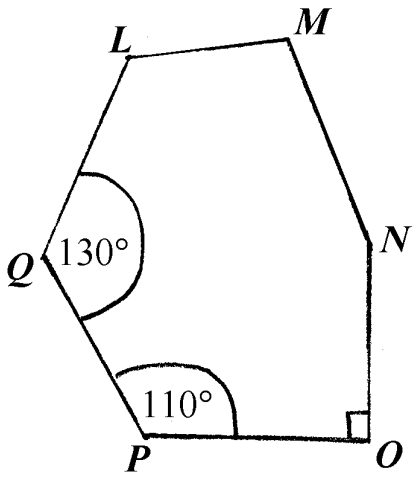


In the diagram above (not drawn to scale) *ABCDEF* represents a regular polygon. Given that the sum of the interior angles of an *n*-sided polygon is $180(n-2)°$, calculate the size of

i. angle *AFE*

ii. angle *BCA*

20. Jun 90

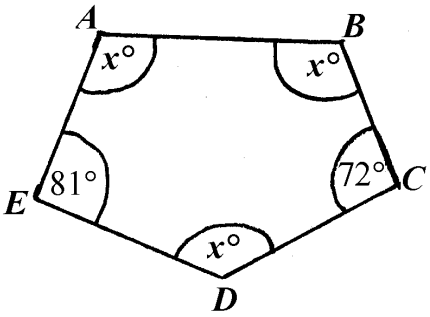


LMNOPQ is a hexagon(not drawn to scale) with $\hat{P}=110°$, $\hat{Q}=130°$ and $\hat{O}=90°$, $\hat{L}=\hat{M}=\hat{N}$

i. Calculate the value of $\hat{L}$

ii. Given that PO = 4cm and the area of ΔNOP = 12 cm^2. Calculate the length of PN in cm, giving your answer correct to one decimal place.

21. Jun 00



ABCDE is a pentagon, not drawn to scale, with $\hat{A}=\hat{B}=\hat{D}=x°$. Angle *C* = 72° and angle *E* = 81°. Calculate the value of *x*.

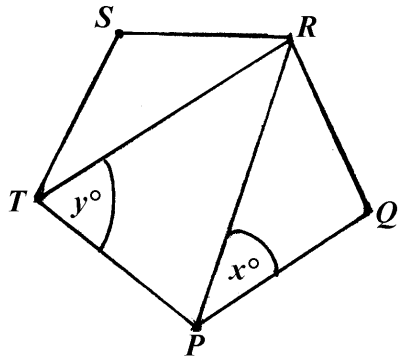
22. Jan 97

The angles of a quadrilateral taken in order are $90°, x°, 2x°, 3x°$

i. Calculate the size of the unknown angles.

ii. Name the type of quadrilateral.

23. Jun 92

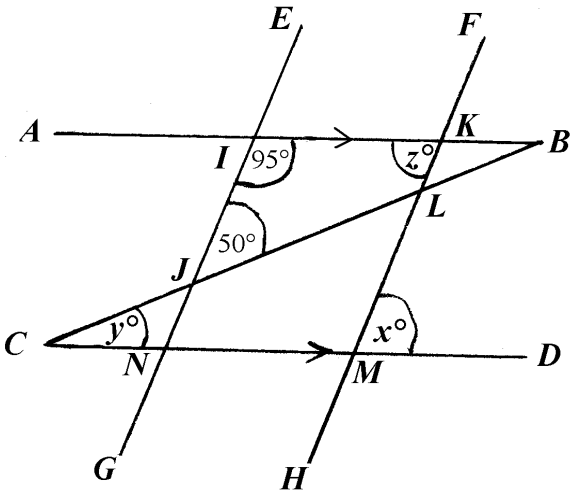


The diagram above, not drawn to scale, represents a regular polygon *PQRST*.

i. Given that the sum of the interior angles of the polygon with n sides is $180(n-2)°$, calculate angle *TSR* and angle *TRS*.

ii. Given further that angle $PQR = x°$, and angle $RTP = y°$, show that $y = 2x$.

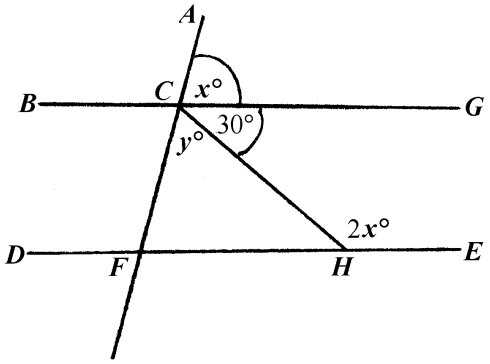
24. Jun 96



In the diagram above, not drawn to scale, *AB* is parallel to *CD* and *EG* is parallel to *FH*. Angle $IJL = 50°$ and angle $KIJ = 95°$

Calculate the values of x, y, and z showing clearly the steps in your calculations.

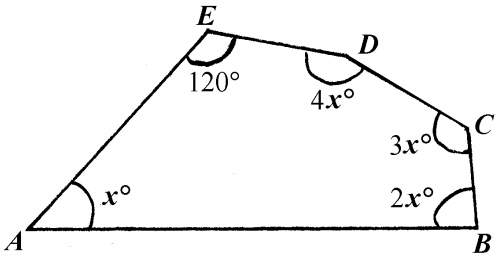
25. Jan 95



In the diagram above, not drawn to scale, *BG* is parallel to *DE*, *AF* and *CH* are straight lines. Calculate the values of x and y showing clearly the steps in your calculation.

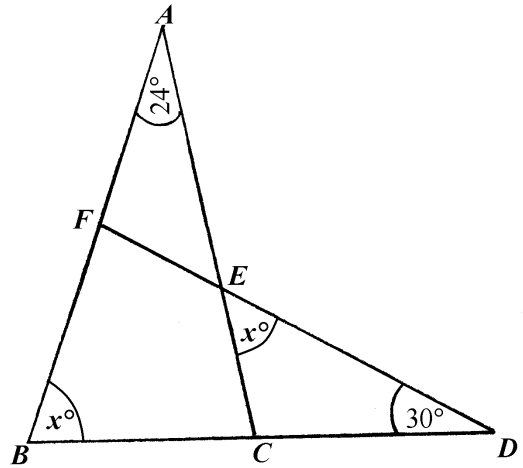
26. Each of the exterior angle of a regular polygon is 20°. How many sides does the polygon have?

27. G Jun 93



ABCDE is a pentagon. The angles *A, B, C, D,* and *E* are $x°$, $2x°$, $3x°$, $4x°$, and 120°. Find the value of x.

28. Jan 92



In the diagram above, not drawn to scale, angles $BAC = 24°$, $EDC = 30°$ and angle $CED = x°$. Calculate in terms of x the size of

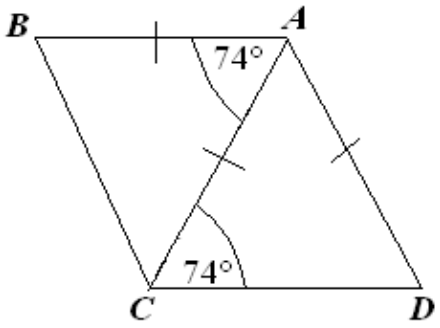
i. Angle *AFD*

ii. Angle *BFE*

iii. Hence deduce the value of x.

29. G Jun 91

In the diagram, ABC and ACD are isosceles triangles in which AB = AC = AD and $\angle BAC = \angle ACD = 74°$



a. Calculate

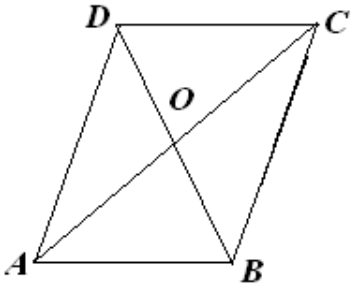
i. $\angle CAD$

ii. $\angle BCA$

b. What special type of quadrilateral is *ABCD*?

30. Jun 89

State three properties which define a rhombus, with respect to its sides, angles and diagonals



ABCD is a rhombus (not drawn to scale) with *AO* = 4.8cm and *BC* = 3.6 cm

Calculate

i. The length of *AB*.

ii. The state of angle *BAD* to the nearest degree.

iii. The area of *ABCD*.

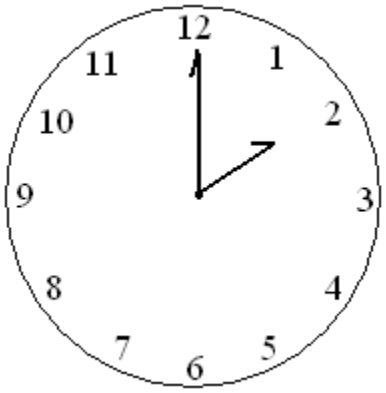
31. Jan 95

Given that π radians = 180° express

i. $\frac{\pi}{6}$ radians in degrees

ii. 210° in degrees

32. Jan 90



The minute hand of a clock is 25 cm long and the hour hand is 21 cm long. Calculate

i. the distance moved by the tip of the hour hand when the time goes from 2 a.m. to 10 a.m. the same day.

ii. the smaller angle between the hands of the clock when the time is 10 o'clock.

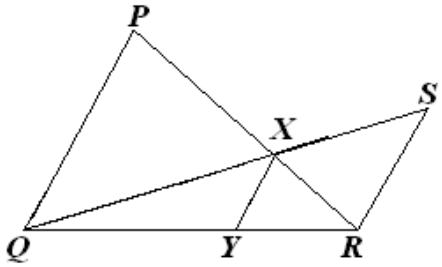
33. Jun 97

In this question, use $\pi = 3.14$

A wheel is turning at a rate of 33 revolutions per minute. Express this speed in radians per second, correct to 2 significant figures

Similar Triangles

34. Jun 91



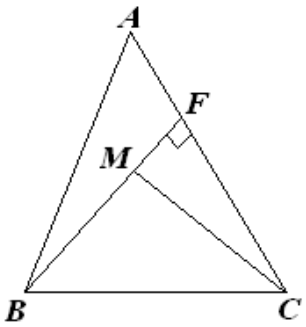
In the diagram above, not drawn to scale, *PQ*, *XY*, and *SR* are parallel lines. *QY* = 10cm, *YR* = 5cm and *XY* = 3cm.

i. Prove that triangle *PQX* and *RSX* are similar.

ii. Calculate the lengths of *PQ* and *RS*.

iii. Calculate the ratio of the areas of the triangles *PQX* and *RSX*.

35. Jan 93

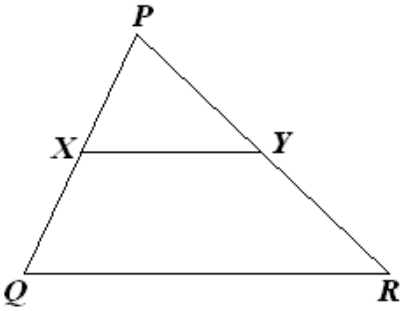


In the figure above, not drawn to scale, $\angle BAC = 80°$. $AB = AC$, $MB = MC$ and BF is perpendicular to AC.

i. Calculate the angles ABF, BMC, and MCF.

ii. Show that triangles ABF and MCF are similar.

36. Jan 95

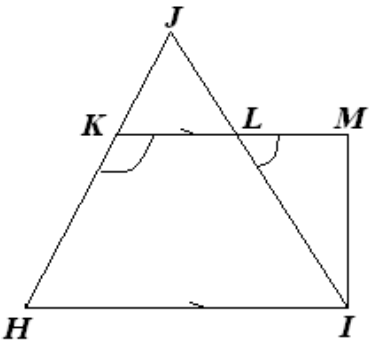


Triangles PXY and PQR, not drawn to scale, are similar triangles. $PX = 4$ cm, $XQ = 6$ cm, and $QR = 8$ cm. Calculate

i. The length of XY in cm

ii. The area of triangle PXY given that the area of triangle PQR is 50 cm^2.

37. Jun 99

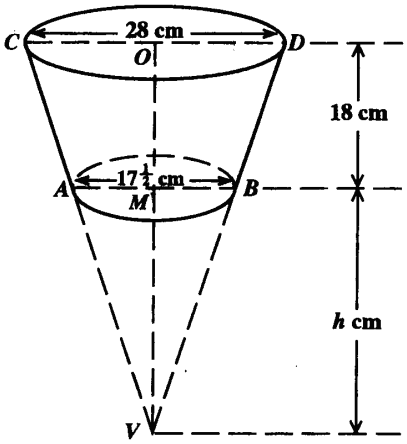


In the diagram above, not drawn to scale, KM is parallel to HI, angle $HKL = 97°$ and angle $MLI = 32°$

i. Show that triangle JKL is similar to triangle JHI.

ii. Given that $KL = 4$ cm and $HI = 10$cm, write down the value of the ratio $\frac{\text{area}\triangle JHI}{\text{area}\triangle JKL}$

38. Jun 2002



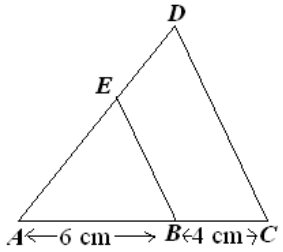
The diagram above, nor drawn to scale, shows $ABCD$, a bucket of height 18 cm. The bucker is made by removing a cone VAB of height h cm. from a larger cone VCD. AMB, the diameter of the circular base of the bucket is $17\frac{1}{2}$ cm. COD, the diameter of the open top is 28 cm.

i. Show giving reasons that $\frac{h}{18+h} = \frac{5}{8}$.

ii. Determine the value of h.

39. Jan 04

In the diagram below, not drawn to scale, triangle *ACD* is an enlargement of triangle *ABE*, with *A* as the center of enlargement, *AB* = 6 cm and *BC* = 4 cm.

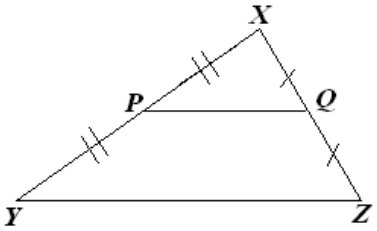


Calculate

i. the scale factor of enlargement which maps triangle *ABE* onto triangle *ACD*.

ii. the area of triangle *ACD*, in cm^2, given that the area of triangle *ABE* is 18 cm^2.

40. Jun 05

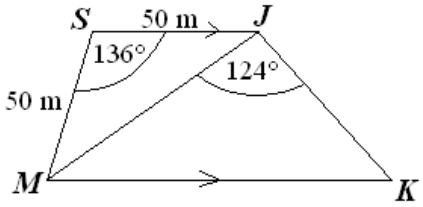


In the diagram above, not drawn to scale, *P* and *Q* are midpoints on the side *XY* and *XZ* of the triangle *XYZ*. Given that *XP* = 7.5 cm and *XQ* = 4.5 cm and the area of triangle *XPQ* = 13.5 cm^2, calculate

i. the size of *PXQ* expressing your answer correct to the nearest degree.

ii. the area of triangle *YXZ*.

41. Jun 05

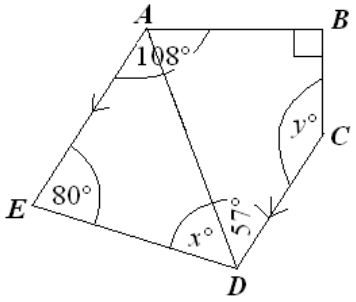


The figure SJKM above, not drawn to scale, is a trapezium with SJ parallel to MK, angle MJK = 124°, image MSJ = 136° and SM = SJ = 50 m.

a. Calculate the size of
   i. Angle SJM
   ii. Angle JKM
b. Calculate, expressing your answer correct to one decimal place, the length of
   i. MJ
   ii. JK

42. Jun 05

In the diagram below ABCDE is a pentagon $\angle BAE = 108°$, $\angle ABC = 90°$, $\angle AED = 80°$, $\angle ADC = 57°$ and AE is Parallel to CD.



Calculate the size of the angle marked

i. $x°$

ii. $y°$

Show all steps in your calculations and give reasons for your answers.

CONSTRUCTION

1. Jun 81

i. Using a ruler and a compass only, construct triangle *ABC* with $\angle A = 60°$, $\angle B = 45°$ and *AB* = 10 cm.
Measure and state the length of *BC* in centimetres.

ii. Find the point *D* on *AB* such that *CD* = *DB*. Measure and state the length of *AD* in centimetres

2. Jun 88

Using a ruler and a compass only for this

question. All construction lines and arcs must be clearly shown and be of sufficient length and clarity to permit assessment.

i. Construct triangle ABC in which $AB = 8$ cm, $\angle A = 45°$ and $\angle B = 60°$
ii. Construct also the perpendicular bisector of AC to meet AB at X.
iii. Measure accurately and state the lengths of AC and AX.

3. Jun 89
Construct triangle BAB such that AB = 8 cm, AD = 6.5 cm and angle DAB = 70°. Through D construct DC parallel to AB. Construct also the line BC perpendicular to AB. Measure and state the length of DC. **[show all construction lines clearly]**

4. Jan 91
Using ruler and compass only, construct triangle PQR in which QR = 8.6, PQ = 7.2 cm and angle PQR = 60°.
i. Construct the perpendicular bisector of PR to meet PR at S
ii. Measure and write down the length of SR in centimetres.

5. Jun 93
Using ruler and compass only, construct a triangle ABC, with AB = 9.5 cm, triangle AC = 7.5 cm and angle BAC = 60°
i. Locate the point D such that DB is perpendicular to AB and is parallel to AB.
Measure and state the length of BD in centimetres.

6. Jan 95
i. Using ruler and compass only, construct a triangle EFG with EF =4.5 cm, FG = 7.5 cm and angle FEG = 45°
ii. Measure and state
a. the length of EG in cm
b. the size of angle FEG

7. Jun 95
i. Using ruler and compass only, construct triangle CAB with angle CAB = 60°, AB = 8 cm and AC = 9 cm.
ii. Construct the perpendicular bisector of AB to meet AC at X and AB at Y
Measure and state the length of XY
iii. Measure and state the size of angle ABC.

[C**redit will be given for construction lines clearly shown]**

8. Jan 96
Using ruler and compass only:
i. Construct triangle FGH with FG = 7.5 cm, angle FGH = 120° and angle GFH = 30°
ii. Locate on FG, the point M, the midpoint of FG. Show all construction lines
Measure and state the size of angle GMH

9. Jun 96
i. Construct triangle LMN with MN = 10 cm, LM = 6.5 cm and LMN = 50°.
ii. Measure and state the length of LN.
iii. Measure and state the size of angle LNM.
iv. Using ruler and compass only, construct LX so that LX is perpendicular to MN and meets MN in X

10. Jun 99
i. Using ruler and compass only, construct $\triangle ABC$ with BC = 10 cm, AB = 4.5 cm and $\angle ABC = 120°$. Bisect $\angle BAC$, such that the bisector of $\angle BAC$ meets BC at X.
ii. Measure and state the length, in cm, of CX.
iii. The size of the angle ACX.

11. Jan 99
Using ruler and compass only, construct a triangle XYZ, in which YZ = 7.5 cm, angle XZY = 30° and angle XYZ = 90°
Measure and write down the length of XY.
[All construction lines must be clearly shown]

12. Jan 00
Using ruler and compass only, construct a triangle WXY with WX = 7 cm, XY = 6 cm and angle WXY = 90°

Measure and write down the size of angle YWX
[All construction lines must be clearly shown]

13. Jan 02
Using a ruler and a compass only, construct a triangle PQR with QR = 6.5 cm, PQ = 8.0 cm and $\angle PQR = 75°$
Measure and state the length of PR in cm.

Triangles and Circles

14. Jan 97
Using ruler and compass only, construct
   i. Triangle PQR with PQ = 8 cm, QR = 7.5 cm, $\angle PQR = 60°$
   ii. The perpendicular bisector of QR
   iii. The circle QR as diameter

15. Jun 01
Using ruler and compass only,
   i. Construct triangle DEF with EF = DF = 7.5 cm and DE = 5 cm.
   ii. Construct the circle which lies within triangles DEF and touches each side of the triangle.
   iii. Measure and write down the length of the radius of the circle

Triangles and Quadrilaterals

16. Jun 83
   a. Construct a triangle ABC such that AB = 6 cm, BC = 4.5 cm and CA = 3 cm.
   b. Construct the image of triangle ABC, found by reflecting triangle ABC in line AB. Label the image of C as C'
   c. Measure and state the length of CC'
   d. If AB intersects CC' at N, write down two statements about NC'
   e. State the type of polygon formed by the composite figure ABC and its image

35. Jan 90
Using ruler an compass only
   a. construct a trapezium ABCD in which AD = 9 cm, AB = 6 cm, BC = 5 cm, angle BAD = 30° and BD is parallel to AD
   b. construct the perpendicular BF to meet AD at F
   c. measure and state the length of BF in centimetres

36. Jun 91
Using ruler and compass only, construct a parallelogram ABCD such that AB = 6.5 cm, AD = 5.7 cm and angle DAB = 60°. Measure and state the length of BD in centimetres

[Note: All construction lines must be clearly shown]

37. Jun 92
   a. Using ruler and compass only, construct a quadrilateral ABCD in which AB = AD = 6 cm, BC = 4 cm, angle BAD = 60°, and angle ABC = 90°.
   b. Measure and state
      i. the length of DC
      ii. the size of angle ADC

38. Jan 93
Using ruler and a pair of compass only, construct a parallelogram OPQR, in which OP = 6 cm, OR = 4 cm and angle ROP = 120°.
Measure and state the length of the longer diagonal

39. Jun 94
Using ruler and protractor, construct quadrilateral VWXY in which YX = 8 cm, angle XVY=80°, VY = 6 cm, XW = 7 cm and angle XYW = 35°. Measure and state the length of VW correct to one decimal place

40. Resit 95
All construction lines must be clearly shown
   a. Using ruler and compass only, construct a quadrilateral ABCD with AB = 8 cm, AD = 8 cm, BC = 5.4 cm, angle DAB = 90°, and angle ABC = 120°
   b. Measure and state the size of the angle BCD

41. Jun 97
   a. Using ruler and compass only, construct the trapezium KLMN with KL parallel to NM, KL = 4 cm, NM = 7 cm, $\angle KLM = 120°$, and LM = 6 cm.
   b. Show that $\angle NKL = \angle MNK = 90°$
   c. Show, by calculation, that the distance between KL and MN is $3\sqrt{3}$ cm.

42. Jun 98
   i. All construction lines must be shown Draw a line PR which measures 7.5 cm. Construct the perpendicular bisector QS of PR to meet PR at O, such that OQ and OS both measure 5 m. Complete the parallelogram PQRS.
   ii. State the name of this type of parallelogram. Measure and state, in cm, the length of PQ.
   iii. Measure and state the size of angle QPS

43. Jan 99

User ruler and compass only, construct a triangle XYZ, in which YZ =7.5 cm, angle XZY = 30° and angle XYZ = 90°. Measure and write down the length of XY

[All construction lines must be clearly shown]

44. Jan 00

Using ruler and compass only, construct triangle WXY with WX = 7 cm, XY = 6 cm and angle WXY = 90°.

Measure and write down the size of angle YWX.

[All construction lines must be clearly shown]

45. Jun 00

Using ruler and compass only:

i. Construct triangle ABD such that BD = 7, angle ABD = angle ADB = 60°.

ii. Construct AX which is perpendicular to BD and meets BD at X

iii. Complete the quadrilateral ABCD such that AC = 2AX.

iv. Measure and write down the length of AC.

v. Name the type of quadrilateral you have drawn

[All construction lines must be clearly shown]

46. Jan 01

Using ruler and compass only, construct a parallelogram KLMN, so that KL = 8 cm, LM = 6 cm and angle KLM = 135°.

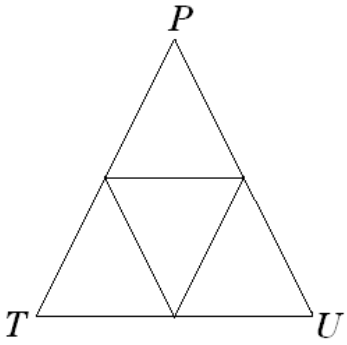
Draw KM. Measure and state its length.

47. Jun 05

Using a ruler and a pair of compass only, construct the rectangle PQRS in which PQ = 8 cm and PS = 6 cm.

Measure and state the length of the diagonal in centimetres.

48. Jan 04



Using ruler and compass only, construct triangle PVY as shown above where each side is of length 6 cm

COORDINATE GEOMETRY

1. Jun 85

A quadrilateral ABCD is formed by joining the points whose coordinates are A(–2, o), B(0, 4), C(7, 3), and D(3, –5)

a. Calculate the length of AC

b. Show that BD is perpendicular to AC

c. Prove that ABCD is a trapezium.

2. Jun 88

The coordinates of A and B are (3, 5) and (7, 1) respectively. X is the midpoint of AB.

a. Calculate

i. the length of AB

ii. the gradient of AB

iii. the coordinates of X.

b. Determine the equation of the perpendicular bisector of AB and state the coordinates of the point at which the perpendicular bisector meets the *y*–axis

3. Jan 90

A straight line HK cuts the *y*–axis at (0 –1). The gradient of HK is $\frac{2}{3}$.

Show that the equation of the line HK is $2x - 3y = 3$.

4. Jun 94

The coordinates of the points A and B are $(5,\ 24)$ and (–10, –12) respectively.

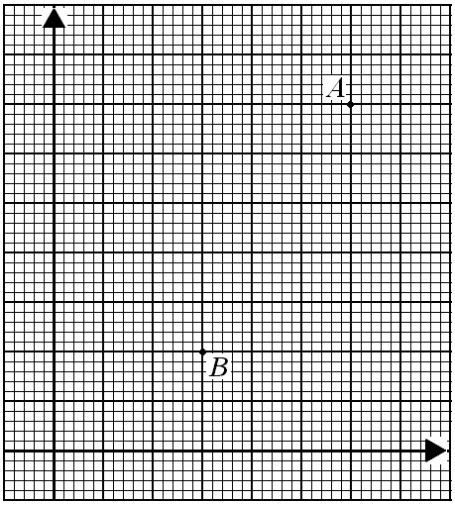
a. Calculate the gradient of the line joining A and B

b. Determine the equation of AB.
c. State the coordinates of the y–axis intercept for the line AB.

5. Jun 95
A straight line is drawn through the points $A(-5, 3)$ and $B(1, 2)$
a. Determine the gradient of AB
b. Write the equation of the line AB

6. Jan 96
The coordinates of A and B are $(3, 1)$ and $(-1, 3)$ respectively.
i. Find the gradient of the line AB.
ii. State the coordinates of the midpoint of A and B
iii. Hence determine the equation of the perpendicular bisector of AB.

7. Resit 95

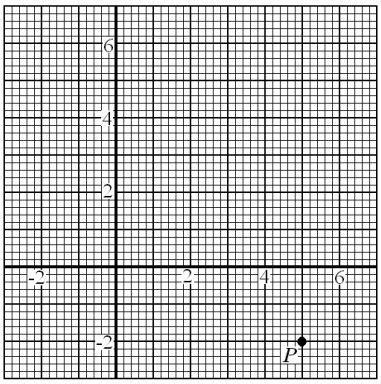


The diagram above shows the two points A(6, 7) and B (3, 2)

a. Calculate the gradient of AB
b. Determine the equation of the line AB
c. Obtain the value of x, if a point P(x, -6) lies on AB

8. Jan 98
The equation of a line ,L, is $5x - 2y = 9$
i. Write the equation of L in the form $y = mx + c$
ii. Hence, state the gradient of the line L
iii. A point, N, with coordinates (h, h) lies on the line. Calculate the value of h.
iv. Find the equation of the line through (0, 2) perpendicular to L.

9. Jun 98
on the graph below, the point P(x, y) has been marked in



i. Write down the coordinates of ***P***.
ii. Through ***P***, draw a straight line whose $y-$axis intercept is 4.
iii. Calculate the gradient of the straight line.
iv. Determine the equation of the straight line

10. Jan 99
The line ,***L***, joining the point (x, 2) to the point (3, –1) has gradient $\frac{-3}{4}$. Determine
i. the value of x
ii. the coordinates of the midpoint of the line joining the point (5, 6) to the point (3, 1)
iii. the equation of the line perpendicular to the line represented by $y = x + 3$ and passing through the point (3, –1)

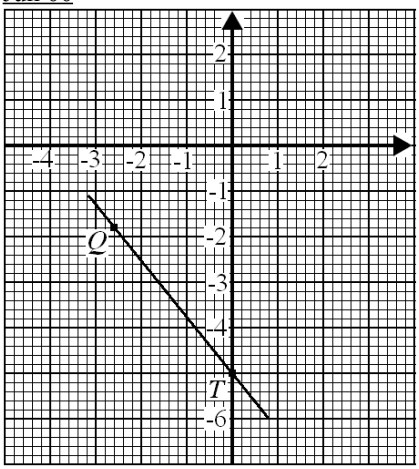
11. Jun 99
The coordinates of the points ***L*** and ***N*** are (5, 6) and (8, -2) respectively.
i. State the coordinates of the midpoint, ***M***, of the line ***LN***.
ii. Calculate the gradient of the line ***LN***.
iii. Determine the Equation of the straight line which is perpendicular to ***LN*** and which passes through the point, ***M***.

12. Jan 00
A straight line joins two points ***H***(-4, 6) and ***G***(5, 3)
i. Calculate the gradient of ***HG***.
ii. Determine the equation of ***HG***.
iii. Write down the gradient of any line drawn perpendicular to ***HG***.

13. Jan 92
A straight line passes through the points ***M***(I, 4) and ***N***(4, –2)

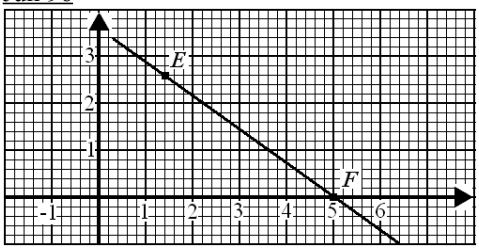
i. Calculate the gradient of the line ***MN***.
ii. Determine the equation of the line ***MN***.
iii. Deduce the coordinates of the point ***L*** where ***MN*** cuts the y-axis

14. Jun 00



The graph above shows a straight line QT intersecting the y– axis at T.
i. State the coordinates of T
ii. Calculate the gradient of QT
iii. Determine the equation of QT

15. Jun 96



The graph above shows a straight line EF intersecting the x-axis at F
i. State the coordinates of F
ii. Calculate the gradient of EF
iii. Determine the equation of EF

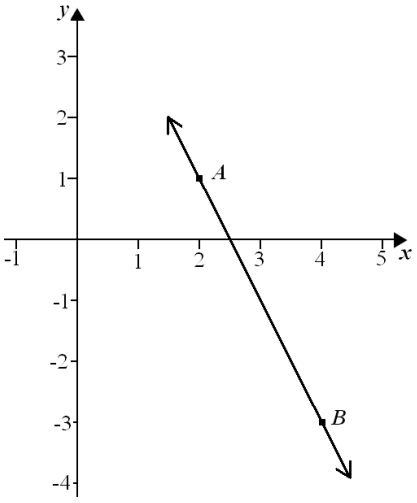
16. Jan 01

E is the point (–2, 5) and ***F*** is the point (2, -3). Find by calculation,
a. the coordinates of ***G***, the midpoint of ***EF***
b. the gradient of ***EF***
c. Determine the equation of the perpendicular bisector of ***EF***.

17. Jun 01

P is the point (4, 2), Q is the point (12, 5) and R is the point (1, 3). Calculate
i. the length of PR
ii. the gradient of PQ
iii. the equation of the line passing through Rand parallel to PQ

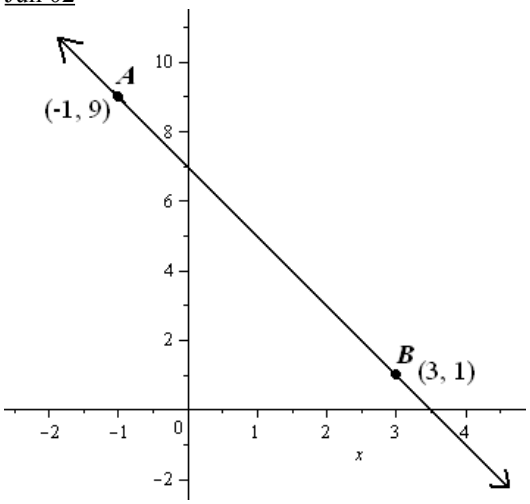
18. Jan 02



The diagram above, not drawn to scale, shows the line AB passing through points A(2, 1) and B(4, –3)
a. Calculate the gradient of the line AB
b. Write the equation of the line AB

CD is a line parallel to AB and passes through the origin
c. Write the equation of the line CD
d. Calculate the gradient of the line perpendicular to CD

19. Jun 02



In the diagram above, **not drawn to scale**, AB is a straight line joining A(–1, 9) and B(3, 1).
a. Calculate the gradient of the line AB
b. Determine the equation of the line AB
c. Write the coordinates of G, the point of intersection of AB and the y-axis
d. Write the equation of the line through O, the origin, that is perpendicular to AB.
e. Write the equation of the line through O that is parallel to AB

20. Jun 81

A and B are coordinates (1,m 2) and (–5, –6) respectively. The lines AC and BC have gradients 3 and –2 respectively

i. Calculate the coordinates of C

ii. S is the midpoint of AC and T is the midpoint of BC. Calculate

a. the gradient of ST

b. the length of ST

21. Jun 84

The points A(0, 9) and B(0, 4) are mapped by a rotation with centre C on to the points $A'(8,\ 7)$ and $B'(4,\ 4)$

a. Using a scale of 2 cm to 1 unit on both axis, plot the points $A,\ B,\ A'$ and B'

b. State

i. The relationship of A and A' to C

ii. The size of the triangle BMC where M is the midpoint of BB'

c. By suitable construction find the coordinates of C.

d. Measure and state the angle of rotation to the nearest degree.

22. Jun 90

x	1	3	6
y	3	19	t

The table above shows the relation of the form $y = kx^2 + c$ where k and c are constants.

Calculate the value of t.

23. Jun 80

The following incomplete table gives points on a straight line L_1

x	0	2	7		11
y		1	–9	–15	

Find the equation of the line L_1, and complete the table.

L_2 is the line perpendicular to L_1 and L_2 cuts the x–axis at (25, 0). Calculate the coordinates of the point where L_2 cuts the y–axis

24. A Jun 89

Find the equation of the line joining A(–1, –9) to B(6, 12).

Another line passes through C(7, –5) and meets AB at right angles at D. Find the equation of CD and calculate the coordinates of D.

25. A Jun 90

The line $3x + y = 15$ intersects the axes at A and B, Find

i. the coordinates of A and of B

ii. the distance AB

26. A Jun 90

Three points have coordinates A(-5, 6), B(1, –4) and C(3, 4).

By calculation

i. show that the triangle is isosceles

ii. find the coordinates of the midpoint of the longest side

27. A Jun 90

The points ***A***(–1, 10) and ***C(***3, 2) re opposite corners of a rhombus ABCD. The midpoint ***B*** lies on the x–axis and ***E*** is the midpoint of ***AC***. Calculate the coordinates of the points ***E***, ***B***, and ***D***.

28. Jun 02

In ΔJKI, the coordinates of the vertices are J(0, 10), K(5, –4), and L(7, 2)

i. Draw ΔJKL

ii. Determine the coordinates of M, the midpoint of KL.

iii. Show by calculation, that JK = JL.

29. June 02

A straight line is drawn through the points A(1, 1) and B(5, –2).

a. Calculate the gradient of the line AB

b. Write down the gradient of any line that is perpendicular to AB.

c. Determine the equation of the line which passes through D(3, 2) and is perpendicular to AB.
Write the equation in the form $y = mx + c$

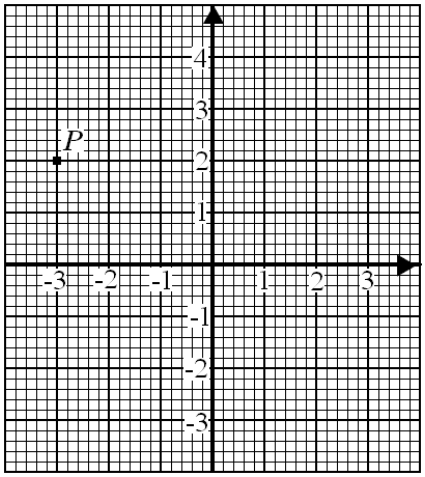
30. Jun 05

A Straight line passes through the point P(–3, 5) and has a gradient of $\frac{2}{3}$.

i. Write down the equation of this line in the form $y = mx + c$

ii. Show that this line is parallel to the line $2x - 3y = 0$

31. Jun 04



On the section of *XY*-plane above

i. Write down the coordinates for the point *P*

ii. Draw the line segment *PQ* through the point *P*, such that gradient of *PQ* is $\frac{-3}{2}$.

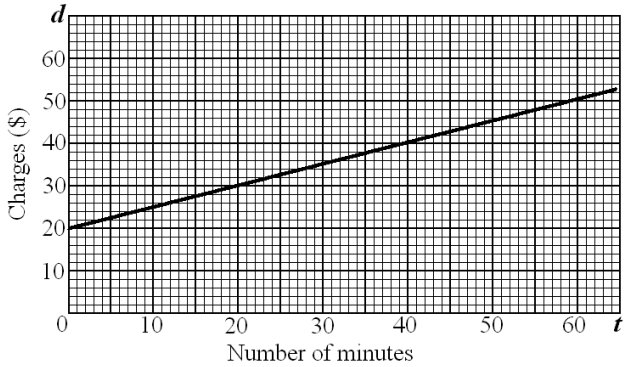
iii. Write down the equation of the line passing through *P* and *Q*.

32. Find the equation of the straight line, AB, that passes through the points A(5, 6) and B(-5, 2). Determine the equation of the line that is parallel to AB and intercepts the *x*–axis (1, 0).

33. Jun 04

The amount a plumber charges for service depends on the time taken to complete the repairs plus a fix charge.

The graph below shows the charge in dollars(*d*) for the repairs in terms of the number of minutes(*t*) taken to complete the repairs.



a. What was the charge for a plumbing job which took 20 minutes?

b. How many minutes were spent completing repairs that cost
   i. $38.00
   ii. $20.00?

c. What is the amount of fixed charge?

d. Calculate the gradient of the line

e. Write the equation of the line in terms of *d* and *t*.

f. Determine the length of the time taken to complete a job for which the charge was $78.00

34. Jan 06

The equation of line *l* is $y = 4x + 5$.
State the gradient of any line that is parallel to *l*
Determine the equation of the line parallel to *l* that passes through the point (2, -6).

35. A straight line connects the points ***P***(-8, 1) and ***Q***(3, -5)

i. Determine the gradient of the line ***PQ***

ii. What are the coordinates of ***M***, the midpoint of ***PQ***

iii. Calculate the distance between ***P*** and ***Q***

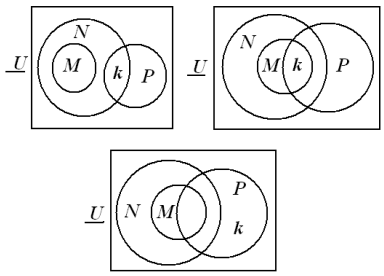
iv. Another point ***R***(9, 6) is connected to ***Q*** by a straight line. Show by calculation that ***QP*** is equal in length to ***QR.***

36. What is the distance between the points A(2, –3) and B(–3, 8)?

SETS

1. Jun 82
   - Draw a Venn diagram to illustrate the following proposition
     i. All students are members of Plymouth School
     ii. Students who study hard swim well
     iii. Kevin, Lisa, and Martin are 5th form students.
     iv. Martin studies hard.
   - Use your Venn diagram to determine whether the following conclusions are true(T), false(F), or inconclusive(I). Justify your answers.
     i. Kevin is a member of Plymouth School
     ii. Martin swims well.

2. Jun 83
   Let
   U = {persons}
   M = {mathematician}
   N = {numerate persons}
   P = {poets}
   Examine each of the Venn diagrams below and state whether each satisfies the following three statements. Justify your answer in each case.
   All mathematicians are numerate
   Some poets are mathematicians
   Krishna Naipaul (k) is a poet

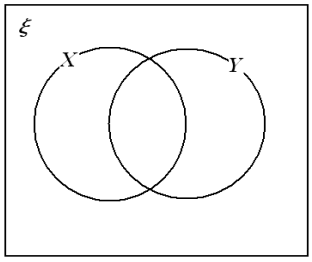


3. Jun 90
   Consider the following three statements:
   1. Some students play basketball
   2. Tall students are over 2 metres in height
   3. All basketball players are tall
      a. Represent the statement in a suitable Venn diagram, showing and stating an appropriate universal set
      b. Show on your diagram
         i. Nina is 1.5 m tall
         ii. Robert who is 2.2 m tall, does not play basketball.

4. Jan 98
   The universal set
   $\xi = \{2,\ 4,\ 6,\ 8,\ 10,\ 12\}$ The set P, Q, and R each contain 2 members and $P \cup Q \cup R = \xi$
   Given that $(Q \cup R)' = (2,\ 12)$, determine
   i. The members of the set P
   ii. The members of $Q \cup R$
   iii. The number of possible subsets which can be formed from $Q \cup R$
   iv. The value of $n(P \cap R)$

Two Intersecting Sets

5. Jun 96



   The Venn Diagram above shows two sets, ***X*** and ***Y*** which are subsets of the universal set ***ξ***.
   Copy the diagram and shade the region which represents $(X \cup Y) \cap X'$

6. Jun 94
   Given the following information:
   U = {3, 6, 9, 12, …, 27}
   E = {even numbers}
   G = {numbers greater than 20}
   E and ***G*** are subsets of ***U***
   i. List the members of E and of ***G***
   ii. Draw a Venn diagram to represent the above data
   iii. State $n(E \cup G)'$

7. Jan 98
   Students in a class of 30 must take either Mathematics or Biology or both. 12 students take both Mathematics and Biology and 20 take Mathematics.

i. Represent this information on a Venn diagram
ii. Calculate the number of students who take biology only

8. Jan 00
A department store sells jewellery and cosmetics. On any one day the total number of persons buying jewellery or cosmetics or both was 400.

250 persons bought jewellery
2*x* persons bought cosmetics only
x persons bought both jewellery and cosmetics

i. Draw a carefully labelled Venn diagram to illustrate the information.
ii. Write an expression, in *x*, to represent the total number of persons buying jewellery or cosmetics or both
iii. Hence, calculate the number of persons who bought cosmetics.

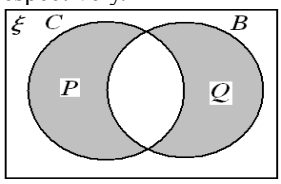
9. Jan 01
In a group of 40 students, all students study Mathematics.
28 students study Biology and Mathematics
20 students study geography and Mathematics
x students study all 3 subjects

i. Draw a Venn diagram to represent the above information, showing, in terms of *x*, the number of students in each subset.
ii. Determine the number of students who study all three subjects.

10. Jan 02
A survey conducted among a group of 50 students showed that:
30 students played football
9 students played cricket and football
x students played neither cricket nor football
3*x* students played cricket only.

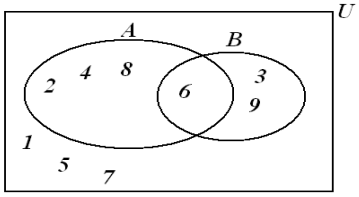
i. Draw a clearly labelled Venn diagram to illustrate the information above.
ii. Determine the number of students who played cricket

11. Jun 98
The following Venn diagram shows set C and D, where P and Q are subsets of C and D respectively.



i. Given that $(n(C) = 33,\ n(D) = 41,$ $n(C \cap D) = x$, write down, in terms of *x*, the values of $n(P)$ and $n(Q)$.
ii. If $n(C \cup D) = 51,$ Calculate the value of *x*.

12. Jun 02



In the Venn diagram above,
U = {whole numbers less than 10} and A and B are subsets of U.

i. Describe A and B in words
ii. List the Members of $A \cap B$ and describe the set, in words, in relation to A and B. Determine $n(A \cap B)'$

13. Jun 03
The Universal set. U. is given as
U = {1,2,3, … 13,14,l5}
The sets A and B are subsets of U such that
A = { Factors of 12}
B = { Multiples of 3}.

i. List the members of the set of A.
ii. List the members of the set of B
iii. Represent the sets, A, B and U, on a Venn diagram.
iv. List the members of $(A \cup B)'$

14. Jun 03
In a group of 55 students,
31 students passed French
2x students passed Spanish only
x students passed both French and Spanish
10 students passed neither French nor Spanish

i. Drew a CLEARLY labelled Venn diagram to illustrate the information above.
ii. Calculate the number of students who passed Spanish.
iii. Calculate the number of students who passed ONLY ONE subject.

Intersecting & Disjoint Sets

15. Jan 98

The Universal Set,
ξ = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}
X={2, 3, 5, 7, 11}
Y = {1, 3, 5, 1, 9, 11}
Z = {4, 8, 12}

i. Draw the Venn diagram to represent the above information.
ii. List the members of the set $X' \cup Y'$

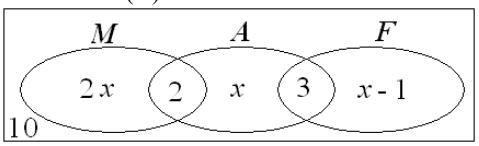
16. Jun 98

The Universal set E contains the sets ***J***, ***K***, and *L* such that : $J \not\subset K$, $J \cap K \neq \varnothing$ and $L \subset (J \cup K)'$

Draw a Venn diagram to show the relationship amongst the sets ***J, K***, and ***L***.

17. Jun 00

The Venn diagram below shows the number of students doing Mathematics (***M***), Accounts (***A***), and French (***F***) in a class of 50.



i. Write down an expression, in terms of *x*, for the number of students who do accounts.
ii. Write down an equation, in terms of *x*, which shows the information in the Venn diagram.
iii. Determine the number of students who do Mathematics only.
iv. Determine the number of students who do French

18. Jun 87

U = {class of 36 pupils}
W = {15 pupils who walk to school}
R = {18 pupils who ride to school}
L = {20 Pupils who lunch at school}

All the pupils who neither ride nor walk to school have their lunch at school.

Ten of the pupils who walk and 7 of the pupils who ride have their lunch at school.

Draw a Venn diagram to represent this information. Indicate clearly the number of elements of each set and subset.

19. Jun 84

U = {natural numbers}
P = {{factors of 12}
Q = {factors of 6}
R = {multiples of 12}

Draw a Venn diagram to represent the these sets and show on the diagram, in the appropriate region the numbers for P, Q, R and $P \cap Q'$

20. Jun 86

A, *B*, and *C* are three sets such that *C* s a subset of *B* and
$n(U) = n(A \cup B \cup C) = 58$, $n(B \cup C) = 35$,
$n(B \cap C) = 22$, and $n(A \cap C) = 10$
$n(A) = 40$, and $n(A \cap B') = 23$

U represents the Universal set. Draw a Venn diagram to represent the above information and hence, determine $n\left[(B \cap A) \cap C'\right]$

21. Jan 89

In a class of 34 students, every student plays at least one of the following games: tennis, cricket, football.
Twenty four students play cricket; sixteen play tennis; and fifteen play football. Those who play tennis also play cricket but not football. Some of the students who play football also play cricket.

i. Draw a carefully labelled Venn diagram to represent the above information.
ii. Calculate:
    1. the number of students who play both cricket and football.
    2. the number of students who play cricket only.

22. Jun 90

i. Draw and label a Venn diagram to show the following information:
A, B, and C are sets and U is the universal set; $n(U) = 45$, $B \subset A$
n(A) = 23, n(8) = 14, n(C) = 20,
$n(A \cap C) = 8$, and n($B \cap C$) = 3,

ii. Hence, determine:
    a. n($A \cup B$) and
    b. n($A \cap B \cap C$)

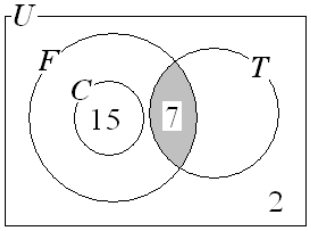
23. Jun 88

Given that:
U is the set of persons In Tobago
C is the set of persons in Tobago who like calypso.
S is the set of persons in Tobago who like steel band.
P is the set of persons in Tobago who like pop-music.
All persons who like calypso also like steel band but do not like pop-music
Some persons who like steel band also like pop-music.

- Draw a carefully labeled Venn diagram to illustrate this data.

- Given that $n(U) = 40000$, $n(S) = 25000, n(c) = 10000$ and $n(P) = 8000$
  Determine
  i. $n(S \cup C)$
  ii. $n(C \cap P)'$

24. Jun 97



The Venn diagram above represents information about the 40 members of a youth club.
F = {members who play football}
C = {members who play cricket}
T = {members who play tennis}
The same number, *x*, play football only and tennis only.

i. Calculate the number who plays football.
ii. State the information represented by the shaded region of the Venn diagram.
iii. State the relationship between the members of ***C*** and ***F***, and between ***C*** and ***T***.

25. Jan 99

There are 50 students in Form 6^S.
Every student does at least one of the subjects Mathematics, Chemistry and Biology.
All students who do Biology also do Chemistry.
No student who does Mathematics does Biology.

7 students do Biology
35 students do Mathematics
25 students do Chemistry
x students do both Mathematics and Chemistry.

i. Draw a clearly labeled Venn diagram to illustrate this information.
ii. Write, in terms of *x*, the number of persons who do Chemistry only
iii. Write an Equation in *x* to represent the total number of students in form 6^S.
iv. Hence, calculate the number of persons who do both Mathematics and Chemistry.

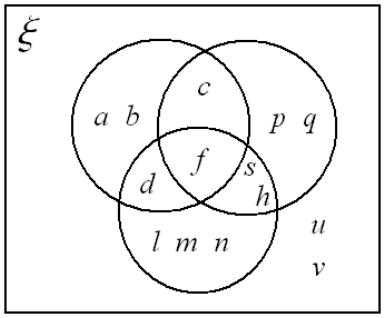
26. Jun 01

The Universal set
U = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}
A = {0, 1, 2, 7, 9}
B = {3, 4, 5}
C = {2}

i. Draw a Venn diagram to represent the above information
ii. List, using set notation, the members of the set $A' \cap B'$.

Three Set Intersections

27. Jun 95



The Venn diagram above shows the universal set ξ and three subsets A, B, and C. The lower case letters written in the diagram are members of the various subsets.

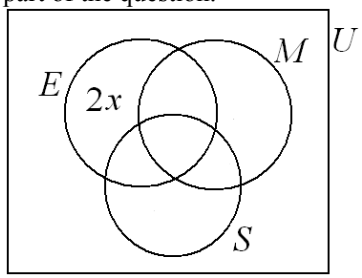
i. List the members of $(A \cup B \cup C)'$
ii. List the members of $B \cap C$

iii. State the value of $n(B \cup C)$

ii. Calculate the value of x.

28. Jan 95

Use the answer sheet provided to answer this part of the question.



In a class of 56 students, each student does at least one of the three subjects, English, Mathematics, and Science.

10 students do English and Science only
5 students do Science only
5 students do Mathematics and English only.
No student does Mathematics only
15 students do three subjects
x students do mathematics and science only
$2x$ students do English only.

i. Complete the Venn diagram to illustrate the information in this question
ii. Write an expression in x to represent the composition of the class
iii. Hence, calculate the number of students who do English only.

26. Resit 95

Information from a survey on 175 persons about the goods, services and prices of a supermarket is as follows:
110 persons complained about the prices
67 persons complained about the services
55 persons complained about the goods
20 persons complained about goods and prices only
11 persons complained about services and prices only
16 persons complained about goods and services only
2 persons had no complaints
x persons complained about all three.

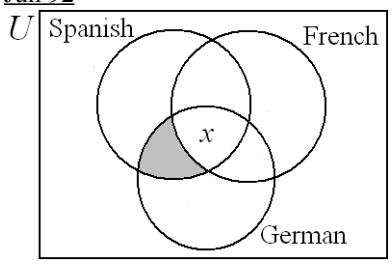
i. Draw a Venn Diagram to represent the information from the survey.

27. Jun 91

There are 50 students in form VI
All students study Mathematics
17 study Biology
18 study Chemistry
24 study Physics
5 study Physics, Chemistry and Mathematics
7 study Physics, Biology and Mathematics
6 study Chemistry, Biology and Mathematics.
2 study all four subjects

a. Draw a carefully labelled Venn diagram to represent the data, using the universal set as the set of students who study Mathematics.
b. Determine the number of students who study at least three subjects.
c. Calculate the number of students who study Mathematics only

28. Jun 92



The Venn diagram above illustrates some of the information given below.
There are 100 members in a foreign language club.
48 members speak Spanish
45 members speak French
52 members speak German
15 members speak Spanish and French
18 members speak Spanish and German
21 members speak German and French
Each member speaks at LEAST one of the three languages
Let the number of members who speak all 3 languages be x.

i. Write an algebraic expression to represent the number of members in the shaded region.

ii. Describe the region shaded.
iii. Write an equation to show the total number of members in the club.
iv. Hence, determine the number of members who speak all three languages.

29. Jan 92

In a town there are 20 shops which sell shoes, hats and dresses.
x shop sell shoes, hats and dresses
9 shops sell shoes and hats
8 shops sell shoes and dresses
10 shops sell hats and dresses.

i. Draw and label a Venn diagram to represent the information given above.
ii. It is given further that:
12 shops sell shoes
15 shops sell hats
14 shops sell dresses .

- Determine in terms of x, the number of shops which sell only shoes.
- Calculate the value of x.

30. Jan 92

Every student of a class of 39 plays AT LEAST ONE of the games: cricket, football, tennis.

2 students play only cricket.
9 students play only cricket and football
5 students play only cricket and tennis
11 students play both football and tennis
x students play all 3 games.

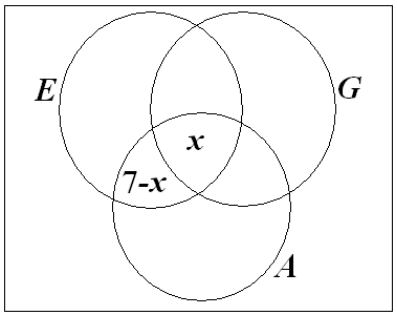
i. Draw a carefully labelled Venn diagram to represent the information above.
ii. Given that nineteen students play no cricket, and that 18 students play tennis;
iii. Calculate:
- the value of x
- the number of students who play only football.

31. Jun 93

There are 68 students In Form V
15 students study Mathematics only
12 students study Physics only
8 students study Physics and Chemistry only
2 students study Physics and Mathematics only
3 students study Mathematics Physics and Chemistry
4 Students do not study any of these subjects

i. Draw a carefully labelled Venn diagram to represent the information above
ii. Determine the number of students who study Physics
iii. Given that X students study Mathematics and Chemistry only, and twice as many study Chemistry only, write an algebraic equation to represent the information given and hence calculate the value of x.

32. Jan 94



A newspaper agent delivers newspapers to a village. He sells the Express, the Advocate, and the Gleaner. Of the 150 households in the village,
40 households receive the Express
35 households receives the Advocate
60 households receives the Gleaner
7 households receive the Express and the Advocate
10 households receive the Advocate and the Gleaner
4 households receive the Express and the Gleaner
34 households receive no papers at all
x households receive all 3 newspapers

i. Copy in your answer booklet the Venn diagram above. Write, in the appropriate regions, expressions in terms of x, for each subset of seta A, E, and G.
ii. Write an algebraic equation in x to illustrate all the information given
iii. Solve the equation and hence determine the number of households which bought the express paper only.

33. Jun 89

A survey on a sample of persons who read at least one of the magazine P, Q, and R yielded the following data.

72 persons read P
53 persons read Q

29 persons read R
14 persons read only P and R
9 persons read only P and Q
2 persons read only Q and R
44 persons read P only.

i. Use x to represent the number of persons who read all three magazines. Draw a carefully labelled Venn diagram to represent the data.
ii. Determine the value of x.
iii. Calculate the number of persons in the sample.

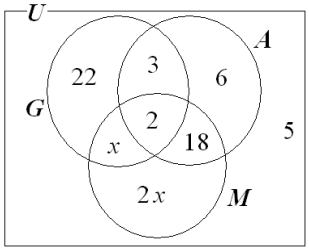
34. Jan 91

There are 46 students in a class. Homework was given in Mathematics, Spanish, and Accounts. 4 students did not do homework. Other students did homework as listed below.

Subject	No. of Students
All three subjects	8
Mathematics and Accounts only	3
Accounts and Spanish only	7
Spanish and Mathematics only	5
Accounts only	2
Spanish only	6

i. Draw a labelled Venn diagram to illustrate the information given above.
ii. Calculate the number of students who did homework in Mathematics.
iii. Calculate the number of students who did homework in only one subject.

35. Jan 97

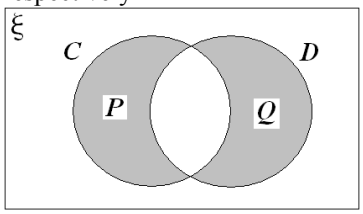


The Venn diagram above shows information on the number of students in a group and their selection of subjects. In the group there were 65 students. The subjects were. Accounts (A), Geography (G), and Mathematics (M). Calculate:

i. the total number of students in the group
ii. the number of students who selected Geography
iii. the probability of randomly choosing a students who does Mathematics only.

36. Jun 98

The Venn diagram below shows sets C and D where P and Q are subsets of C and D respectively



i. Given that n(C) = 33, n(D) = 41, $n(C \cap D) = x$, write down in terms of x, the values of n(P) and n(Q).
ii. If $n(C \cap D)=51$, calculate the value of x.

37. Jun 99

Given that $E = \{a, b, c, d, e, f, g\}$
$L = \{a, b, c, d, e\}$
$M = \{a, c, e, g\}$ and
$N = \{b, e, f, g\}$

i. Draw a Venn diagram showing the sets: E, L, M and N and their elements
ii. List the members of the set represented by $(L \cap M) \cup N$
iii. Write down the value of $n(L \cap M) \cup N'$

38. Jun 85

Of the 100 candidate who wrote examination in Computer Science, Statistics and Accounts, 48 candidates passed Computer Science; 14 passed Computer Science and Accounts only; and 14 passed Statistics and accounts only.
Three times as many passed both Statistics and Computer Science Accounts as all who passed each subject only.

Assume that :
x candidates passed Statistics only
x candidates passed Accounts only
x candidates passed Computer Science only
y candidates passed all three subjects.

Represent the information given on a suitable Venn diagram and hence write down two equations in x and y which can be used to solve for x and y.

39. Jun 04

A club has 160 members, some of whom play Tennis (T) or cricket (C) or both.90 members play tennis, 86 play cricket and 10 play neither x play both tennis and cricket.

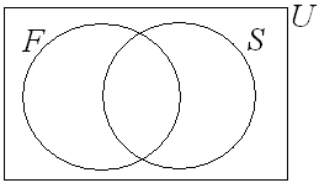
a. Draw a Venn diagram to represent this information
b. How many members play both tennis and cricket?

40. Jan 05

32 candidates took examination at a CXC examination centre

11 took French (F)
9 took Spanish (S)
x took Both French and Spanish
18 took neid1er French nor Spanish

i. Copy and complete die following Venn diagram to represent the information



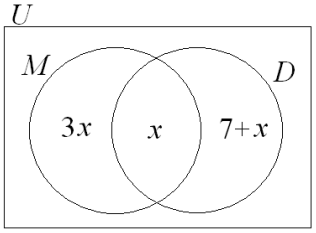
ii. Write an equation in x for the number of students in the universal set
iii. Calculate the value of x
iv. Shade the region $F' \cap S$

41. Jan 04

The following information is given
$U = \{1, 2, 3, ..., 10\}$
$P = \{1, 2, 5, 10\}$
$Q = \{2, 3, 5, 8, 9\}$
P and Q are subsets of U the Universal set

a. Draw a Venn diagram to represent the information shown above
b. List using set notation the member of the set
   i. $P \cap Q$
   ii. $(P \cap Q)'$

42. Jun 05



In the diagram shown above, the Universal set, (U), represents all the students in a class. The M represents all the students who take Music. The set D represents the students who take Drama. If 24 students take music, calculate
i. the number of students who take both Music and Drama
ii. the number of student who take Drama only

STATISTICS

1. Jun 81

If two digits are chosen at random from the set of 10 digits {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}, calculate the probability
a. that their sum is 9
b. that their sum is 9 or 15

2. Jun 81

A bag contains two white marbles and 3 blue marbles.
a. A marble is selected at random from the bag. Calculate the probability that the marble is white
b. If the white marble is not replaced in the bag, calculate the probability that the second marble selected from the bag will be blue

3. Jun 82

On assembly line for bottling soft drinks, the bottles may defective in three ways:
A: the bottle contains foreign bodies
B: the bottle contains less than 20 millilitres of liquid
C: the bottle is chipped

All the bottles found defective in any or all of these ways are rejected. The probability of A is 1 in 50, the probability of B is 1 in 40, and the probability of C is 1 in 20.
Assuming these events are mutually independent

of each other, calculate the probability that a bottle chosen at random from the assembly line

a. Is defective in all three ways
b. Contains foreign bodies and less that 240 litres of liquid.

4. Jun 83

Six men and 4 women, including a man and his wife apply for a job at a firm.

a. Calculate the probability that, if two applicants are selected at random, at least one of them is a man
b. If the man and his wife are selected in how many ways can two other persons also be selected from the remaining applicants
c. Calculate the probability that, if four applicants are selected at random, the man and his wife are selected

5. Jun 84

i. In how many ways can a committee of 5 be chosen from 5 men and 7 women
ii. Calculate the probability that if a committee of 5 is chosen there are 2 men and 3 women on this committee

6. Jun 86

In a spelling competition, two contestants, Alfred and Brian are given different words to spell. The probability that Alfred spells correctly any word given to him is $\frac{2}{3}$ and the probability that Brian spells any word correctly is $\frac{4}{5}$. Calculate the probability that

a. both Alfred and Brian spell their word correctly
b. either Alfred of Brian, but not both, spells his word correctly.
c. When given three words, Alfred spells
   i. only the first two words correctly
   ii. any two words correctly

7. Jun 85

The draw for a tennis tournament involving 3 professionals and 5 amateur players is made as follows

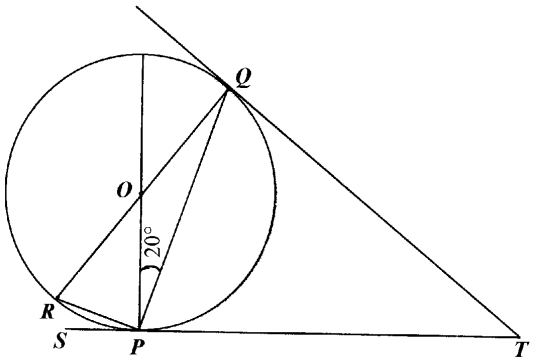
1st Round	2nd Round	3rd Round
Albert (p) vs Brian (a)	_____ –	
Charles (p) vs David (a)	vs _____ –	_____ –
Eric (p) vs Frank (a)	_____ –	vs
George (p) vs Harold (a)	vs _____ –	_____ –

8

8.

CIRCLE THEOREM

1.



In the diagram above, not drawn to scale, *STP* and *TQ* are tangents of the circle, centre *O*. Angle *OPQ* = 20°.

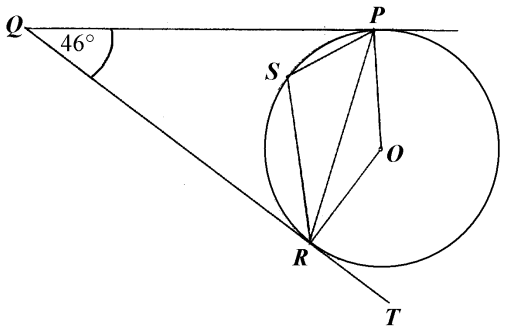
Calculate giving reasons to support your answers

iii. angle *ROP*

iv. angle *RPT*

v. angle *QTP*

2.



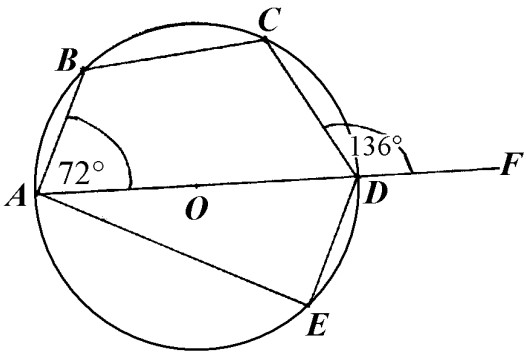
In the diagram above, not drawn to scale, *PS* and *SR* are chords of the circle, centre *O*. Two tangents from *Q* touch the circle at *P* and *R* respectively.
Angle *PQR* = 46°.
Calculate, giving reasons to support your answers

i. ∠*POQ*

ii. ∠*PSR*

iii. ∠*PRQ*

3.

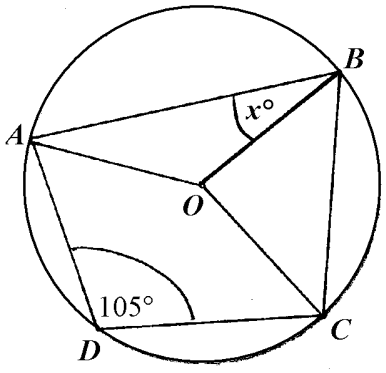


In the figure above, not drawn to scale, *ABCD* is a pentagon inscribed in a circle centre *O*.
Angle *CDF* = 136° and angle *BAD* = 72°

b. Calculate, giving reasons for your answer the magnitude of angles
   i. *CDA*
   ii. *BCD*
   iii. *AED*

c. Given that *OA* = 15 cm and angle *EAD* = 35°, calculate the length of *AE*.

4.

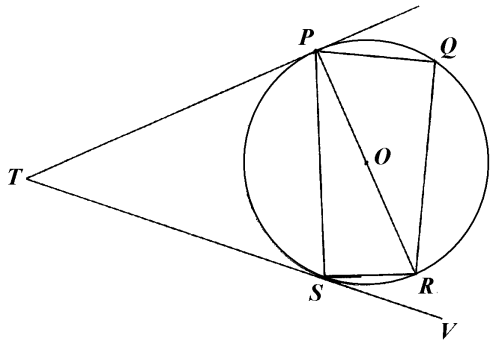


In the figure above, not drawn to scale, *A, B, C,* and *D* are points on a circle, centre *O* and radius 36 mm.
Angle *ADC* = 105°, angle *OBA* = *x*° and is twice angle *OBA*.
Calculate:

a. The size of angle *OAB*

b. The length of the arc *ABC* in mm, using $\pi = \frac{22}{7}$

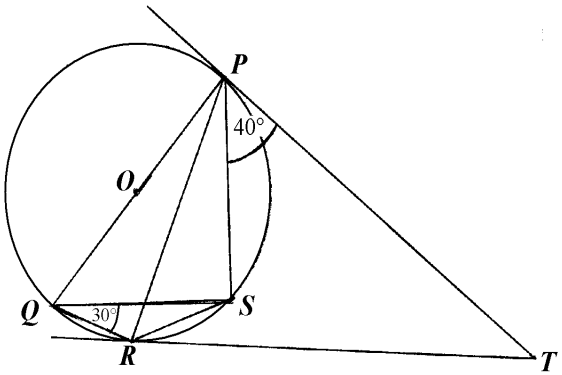
5.



In the figure above, not drawn to scale, the quadrilateral *PQRS* is inscribed in the circle centre *O*, *PR* passes through *O*. The tangents TP and TS are drawn to the circle from *T*.
Angle *RSV* = 20°.
Calculate, giving reasons,

i. ∠*PQR*
ii. ∠*SPR*
iii. ∠*PST*
iv. ∠*PTS*

6.



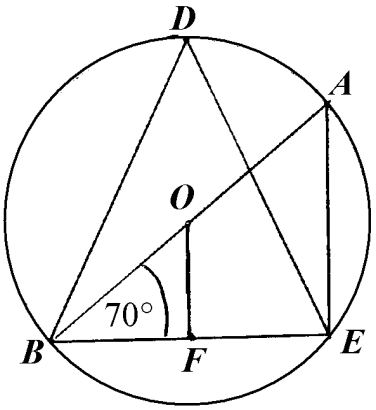
In the diagram above, not drawn to scale, *TP* and *TR* are tangents to the circle at the points P and R respectively. The angle *SQR* = 30° and the angle *SPT* = 40°. The centre of the circle is at *O*. Calculate, giving reasons to support your answer the size of:

i. $\angle SRT$
ii. $\angle PQS$
iii. $\angle PSR$
iv. $\angle PTR$

7. The sum of the interior angles of a regular polygon is 1800°

i. How many sides does this polygon have?
ii. What is the measure of one of its exterior angles?
iii. What is the measure of one of its interior angles?

8.

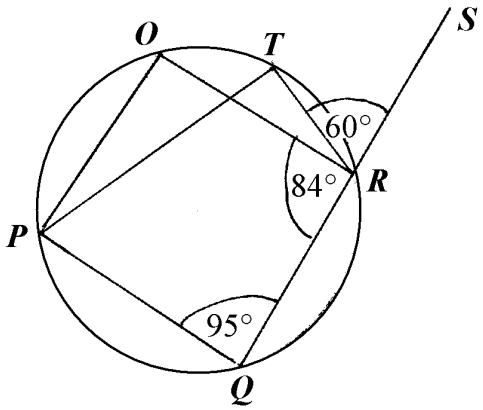


In the diagram above, not drawn to scale, O is the centre of the circle and AOB is a diameter. D is a point on the circumference and F is the midpoint of the chord BE. $A\hat{B}E = 70°$.

i. Calculate $B\hat{D}E$
ii. Show that $\triangle OFB$ and $\triangle AEB$ are similar
iii. Calculate $A\hat{O}F$

(Note: State reasons and show necessary working)

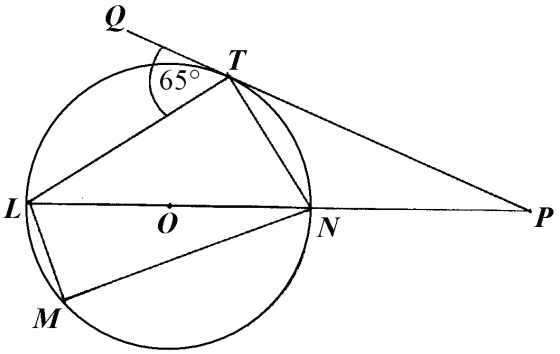
9.



In the figure above, not drawn to scale, QRS is a straight line, $P\hat{Q}R = 95°$, $O\hat{R}Q = 84°$, and $T\hat{R}S = 60°$. Calculate the following angles giving reasons for your answer

i. $P\hat{O}R$
ii. $P\hat{T}R$
iii. $T\hat{P}Q$
iv. $O\hat{P}T$

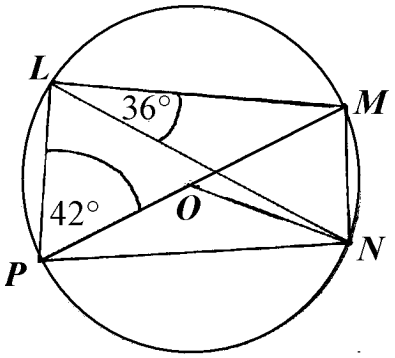
10.



In the diagram above, not drawn to scale, *O* is the centre of the circle *LMNT* and *PTQ* is a tangent to the circle at *T*. Given that $L\hat{T}Q = 65°$, calculate stating your reasons the size of:

i. $L\hat{M}N$
ii. $L\hat{N}T$
iii. $T\hat{L}N$
iv. $T\hat{P}N$

11. Resit 95

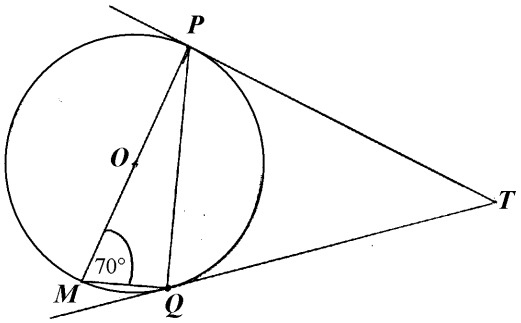


In the figure above, not drawn to scale, *PLMN* is a circle with centre *O*. the angle MLN = 36° and the angle *MPL* = 42°. Calculate giving reasons to support your answer the size in degrees of the angles

i. *NPM*
ii. *PON*
iii. *PLN*
iv. *LMN*

12. Two angles are complementary. One measures $7x°$, the other measures $3x°$. What is the value of x?

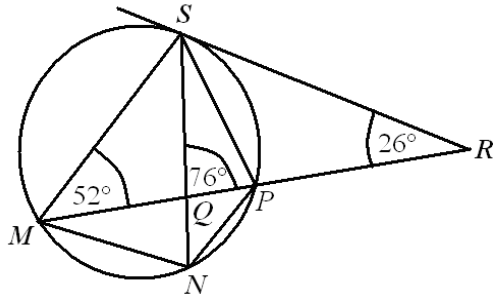
13.



The diagram above, not drawn to scale, shows *TP* and *TQ* as tangents to a circle from the point *T*. The circle has centre *O* and the angle *OMQ* = 70°
Calculate giving reasons for your answer , the measure of

i. angle *POQ*
ii. angle *MPQ*
iii. angle *PTQ*

14. Jun 97

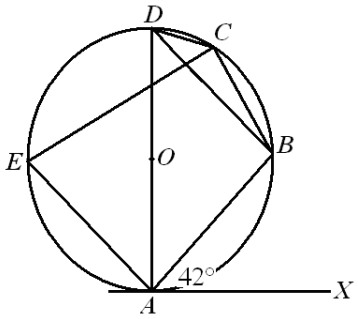


In the figure above, not drawn to scale, SR is a tangent to the circle. The chords SN and MP intersect at Q. The chord MQP produced meets the tangent SR at R. Angle SRP = 26°, angle QMS = 52° and angle PQS = 76°.

a. Calculate, giving reasons
   i. angle MSQ
   ii. angle RSP
   iii. angle SPN

b. Given that SR = 12cm, show that the area of $\Delta MRS = 39\text{cm}^2$ to two significant figures.

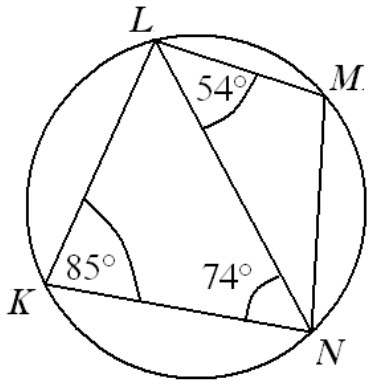
15. Jan 97



In the diagram above, not drawn to scale, AX is a tangent to the circle, centre O. $B\hat{A}X = 42°$, CD = CB and EA || CB

i. Name two angles, each of which measures 90°
ii. Show that $C\hat{D}B = C\hat{B}D = 24°$. Give reasons
iii. Calculate the size of $C\hat{B}A$, $B\hat{A}E$, and $D\hat{C}E$

16. Jun 98

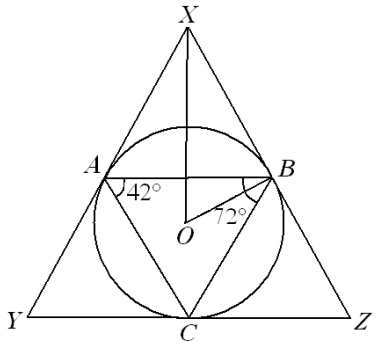


The above diagram, not drawn to scale, shows a circle passing through the points LMNK. Given $\angle LKN = 85°, \angle KNM = 74°$ and $\angle MLN = 54°$, calculate giving reasons for your answer, the size of

i. $\angle LMN$

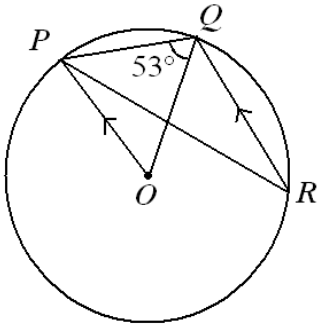
ii. $\angle LNK$

17.



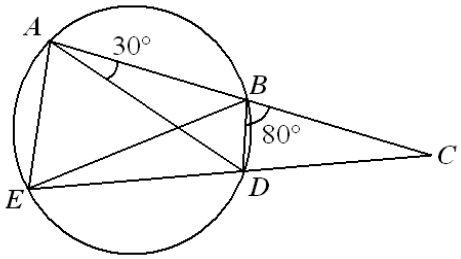
The above diagram, not drawn to scale, shows a circle centre O touching the sides of triangle XYZ, at A, B, and C. Given $\angle BAC = 42°$ and

18.

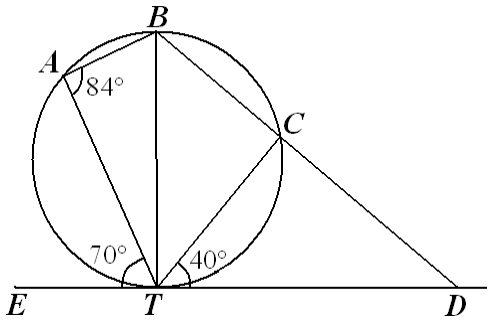


22.

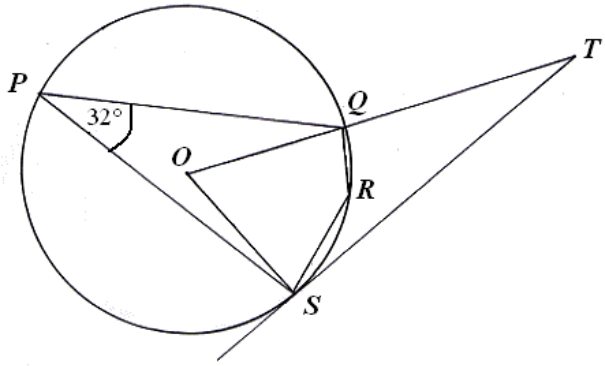
19.



20.



21. The diagram below, not drawn to scale, shows the points P, Q, R, and S which all lie on the same circumference of a circle with centre O.



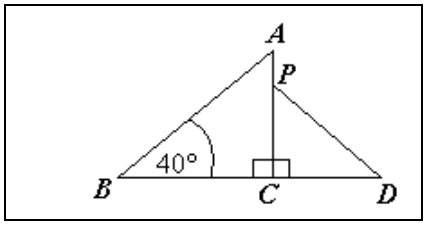
ST is a tangent to the circle at S. OQT is a straight line. The angle QPS is 32°.

i. Find the size of angle QTS. For full marks you must give reasons for your answer.

ii. Find the size of angle QRS. For full marks you must give reasons for your answer.

1.

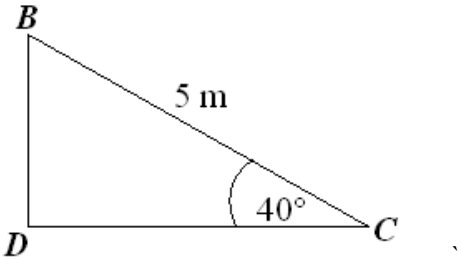
2. Jun 96
The diagram below, **not drawn to scale,** shows ***ABC*** and ***PCD*** are right angled triangles. Angle ***ABC*** = 40°, ***AB*** = 10 cm, ***PD*** = 8 cm and ***BD*** = 15 cm.



Calculate, giving your answers correct to 1 decimal place

i. The length of ***BC*** in centimetres
ii. The size of angle ***PDC*** in degrees

2. The figure below, **not drawn to scale**, ***BC*** = 5 angle ***BCD*** = 40° and angle ***BDC*** is a right angle



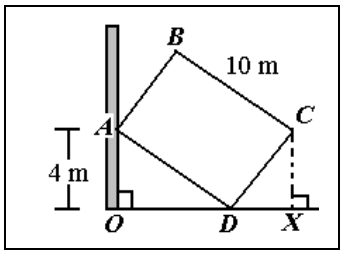
i. Calculate the length in metres of ***BD***
ii. Calculate the length in metres of ***DC***
iii. Prove that the area in m^2 of the triangle ***BDC*** is

$12.5 \sin 40° \cos 40°$

3. A plane takes off at an angle of elevation of 17° to the ground. After 25 seconds the plane has travelled a horizontal distance of 2400 m

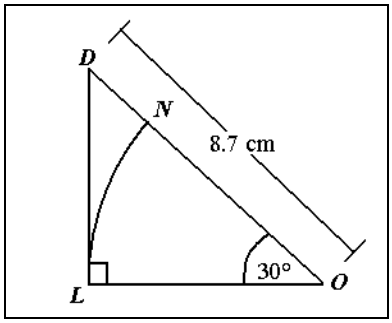
i. Draw a sketch to represent the information.
ii. Calculate to 2 significant figures the height of the plane above the ground after 25 seconds

4. The following diagram shows a rectangular sheet of metal, ***ABCD***, supported by a vertical wall (shaded), which is at right angle to the level ground ***OX***. ***AB*** measures 3 m and ***AD*** measures 10 m. ***A*** is 4 m above ***O***.



i. Calculate the size of angle ***ODA***
ii. Hence, calculate the size of angle ***CDX***
iii. If ***CX*** represents the height in metres of ***C*** above the ground, calculate ***CX***.

5. In the diagram above, **not drawn to scale**, ***OLN*** is a sector of a circle centre ***O*** and ***ON*** is produced to ***D***. Angle ***DLO*** = 90°, Angle ***DOL*** = 30° and ***DO*** = 8.7 cm.

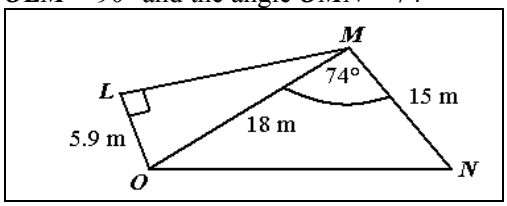


Calculate

i. the length of ***DL***
ii. the radius of the sector ***OLN***
iii. the area of the sector ***OLN***

6. A boy standing on a vertical cliff, 50 m high, is looking down an angle of depression of 20°at a car. How far is the car from the base of the cliff?

7. The following diagram represents a plot of land, ***LMNO***, **not drawn to scale,** in which ***LO*** = 5.9 m, ***OM*** = 18 m, ***MN*** = 15 m, angle ***OLM*** = 90° and the angle ***OMN*** = 74°

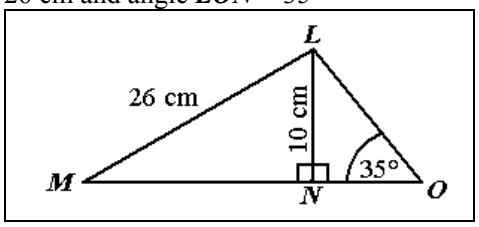


Calculate in metres

i. the distance ***LM***
ii. the distance ***ON***
iii. the perimeter of the plot of land

8. The figure below, Not drawn to scale, shows triangle ***LMO***, with height ***LN*** = 10 cm, ***LM*** =

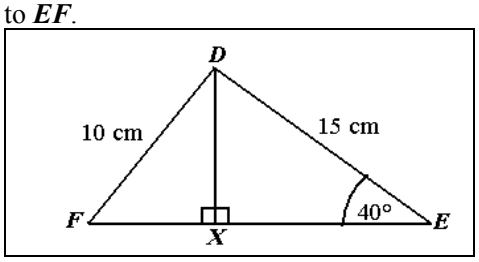
26 cm and angle ***LON*** = 35°



Calculate, in cm

i. ***MN***
ii. ***MO***

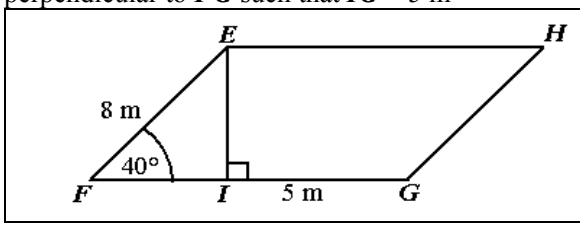
9. In the diagram below, **not drawn to scale,** ***DEF*** is a triangle with ***DE*** = 15cm, ***DF*** = 10cm, angle ***DEF*** = 40°. ***DX*** is perpendicular to ***EF***.



Calculate

i. The length in cm of ***DX***
ii. The size of the angle ***EDF***

10. The diagram below, **not drawn to scale**, represents one face of a roof of a house in the shape of a parallelogram ***EFGH***. Angle ***EFI*** = 40°. ***EF*** = 8 m. ***EI*** represents a rafter placed perpendicular to ***FG*** such that ***IG*** = 5 m



Calculate giving your answer to 3 significant figures

i. the length of ***FI***
ii. the length of ***EI***
iii. the area of ***EFGH***

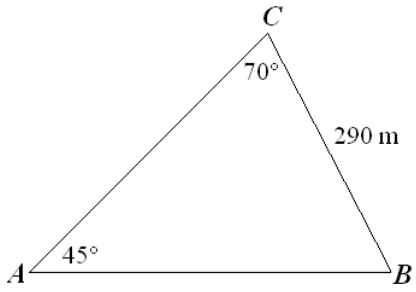
11. A vertical pole stands on horizontal ground. From the top of the pole, ***h*** metres high, the angle of depression of a spot 10 m from the foot of the pole is 25°.

i. Sketch a diagram to represent this information, showing the pole, the ground and the measurements given.
ii. Calculate the value of ***h***.

12. ;
13.
14.
15.
16.
17.
18.

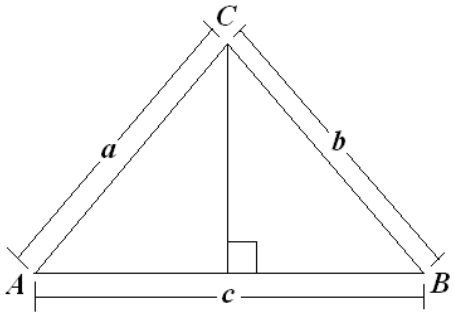
TRIGONOMETRY 2

1. Jun 83



The dimensions of a plot of land, ABC, are such that the angle BAC ==45°, angle ACB = 70° and BC = 290 m.
Calculate, to two significant figures, the length of AB.

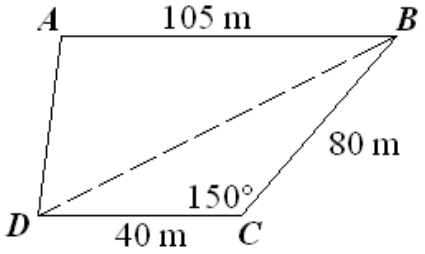
2. Jun 84



In the triangle ABC above, angle C is obtuse and CD is perpendicular to AB. Prove that $\frac{a}{\sin A} = \frac{b}{\sin B}$.

3. Jun 82

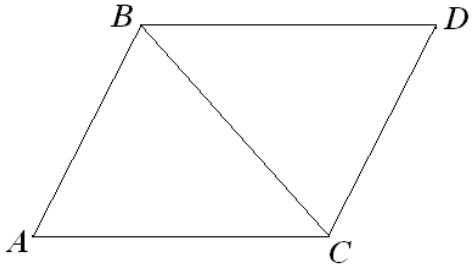
The trapezium ABCD below (not drawn to scale) is a diagram of a plot of land such that AB is parallel to DC. DC = 40 m BA = 105 m, CB = 80 m and angle DCB = 150°



Calculate to 3 significant figures

a. the length of BD
b. the area of ABCD

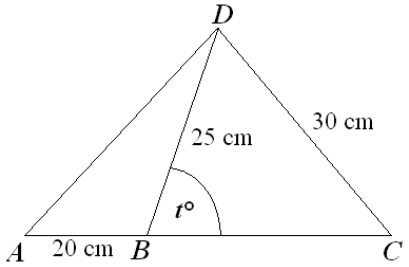
4. Jun 87



In the parallelogram ABCD (not drawn to scale), AB = 9 cm, BD = 10 cm, and the angle BCD = 44.4°

i. Calculate to the nearest whole number, the size of the angle BDA
ii. Using the cosine rule, calculate the length of AD

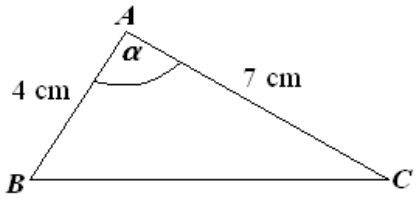
5. Jun 89



In the diagram above(not drawn to scale), AB = 20, CD = 30cm, DB = 25 cm and the angle DBC = $t°$

i. Given that $\cos t° = \frac{7}{25}$, use the cosine rule, or otherwise, to calculate the length of AD to the nearest cm.
ii. Write down an expression for $\sin B\hat{C}D$ in terms of t and hence show that $\sin B\hat{C}D = \frac{4}{5}$

6. Jun 93

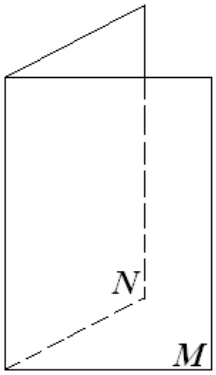


In the triangle ABC above, **not drawn to scale**, AB = 4 cm, AC = 7 cm and angle BAC is .

Given that $\sin^2 \alpha = 0.64$, determine

i. the exact value of $\cos^2 \alpha$
ii. the value of α, if $90° < \alpha < 180°$
iii. the length of BC, correct to one decimal place.

7. Jan 97

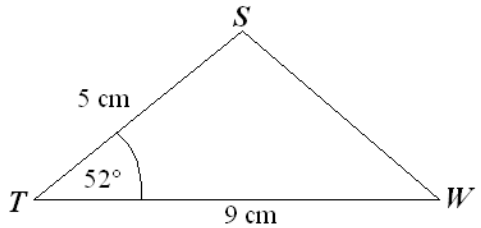


The figure above (not drawn to scale) shows the rectangular cover of a book. The cover is 12 cm long and 8 cm wide and is opened at an angle of 124

Calculate to one decimal place

i. The length of the diagonal of the cover
ii. The distance between the corners M and N

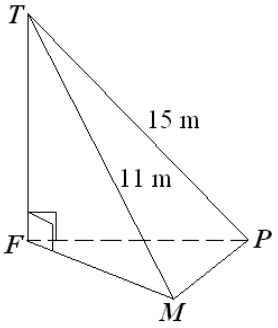
8. Jun 02



In the diagram above (not drawn to scale) ST = 5 cm, TW = 9 cm and angle STW = 52° calculate

i. the length of SW
ii. the area of $\triangle STW$

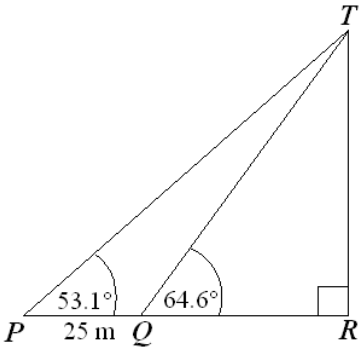
9. Jun 85



TF is a vertical flagpole, F, M and P are points on the same horizontal plane. Two ropes TP and TM are attached to the top of the pole. The angles of depression of M and of P from T are 60° and 40° respectively. TP = 15 m, and TM = 11 m, and angle PFM = 45°.
Calculate the length of

a. PF
b. MP

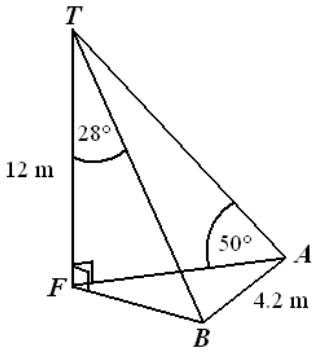
10. Jun 87



The diagram above (not drawn to scale) shows ths angles of elevation of T, the top of a vertical mast from the points P and Q from the same side of R on a horizontal plane. P, Q and R lie on a straight line. PQ = 25 meters, angles TPQ and TQR are 53.1° and 64.6° respectively.

i. Show that the length of QT is 100 metres to the nearest metre.
ii. Hence or otherwise calculate the height of the mast.

11. Jan 01



The diagram above (not drawn to scale) shows a pole ***TF*** 12 m high, standing on level ground. The points ***A***, ***F***, and ***B*** lie on the same horizontal plane.
AB = 4.2 m, $B\hat{T}F = 28°$, and $T\hat{A}F = 50°$.
$T\hat{F}B$ and $T\hat{F}A$ are right angles.

a. Calculate
   i. the lengths of ***FB*** and ***FA*** giving your answer to three significant figures
   ii. the size of $A\hat{F}B$, to the nearest degree
   iii. the bearing of ***B*** from ***F***.**
b. Given that the area of triangle ***BTA*** =28.1 m^2 and ***AT*** = 15.7 m, calculate the size of $B\hat{T}A$.

12.