National 5 Assessment 1 Revision

Fractions

1. a. $2\frac{1}{3} + 3\frac{2}{5}$

   b. $\frac{9}{16} \times \frac{4}{15}$

   c. $\frac{4}{5} \div \frac{16}{25}$

   d. $\frac{1}{2} + \frac{3}{4} \, of \, \frac{2}{3}$

   e. $\frac{2}{3}(\frac{2}{3} + \frac{1}{4})$

   f. $\frac{4}{5} - \frac{3}{4} \, of \, \frac{8}{9}$

Expanding brackets

2. a. $(3a – 2)(4a + 5)$

   b. $3 – 2(x + 3)(x – 4)$

   c. $3(x + 3)^2$

   d. $(x + 4)(x^2 + 4x – 1)$

   e. $(2x – 3)(3x^2 + 5x – 2)$

Equations/Inequations: Solve the following:

3. a. $3(2x + 1) = 2(2x + 5)$

   b. $\frac{(x+4)}{3} + 1 = 5$

   c. $\frac{x}{3} + \frac{3x}{4} = 8$

   d. $3x + 2 > 2x + 8$

   e. $2(2x – 3) < 9x$

   f. $\frac{10}{x} > 5$

Percentages

4. A house was bought in 2014 for £188,500. The value has steadily increased by 5.55% each year. After 4 years, how much is the house now worth? Give your answer correct to 3 significant figures.

5. Harry put £1200 into a savings account with an annual interest rate of 2.05%. He agrees to not touch the account for 3 years. Calculate how much compound interest he will make in 3 years.

   Give your answer correct to 2 significant figures.

6. Every year John measures himself on his birthday. On his 12th birthday he was 138cm tall. On his 13th birthday he measured himself to be 151cm tall.

   Express his growth in height as a percentage of his original height.

7. Kevin got a 15% pay rise and is now earning £32,500 per annum.

   What was Kevin earning before his pay rise?

8. The population of a small village decreased by 20% in 2018 to 4800.

   How many people lived in the village in 2017?

Linear Relationships

9.   Find the gradient and y-intercept of the following equation:

   a. 2y = 4x + 5   b.   3y − 2x − 4 = 0   c.   3x + 5y − 3 = 0

10.   Find the equation of the line connecting points:

   a. (3,5) and (5,9)   b.   (1,4) and (4,6)   c.   (-2,-4) and (3,5)

11.   Find the coordinates of where the line crosses both the x and y axis.

   a.   y = 3x + 4   b.   2y = 3x − 2   c.   2y + 3x = 5

12.   The following shows a group of pupil's maths test scores and physics test scores.
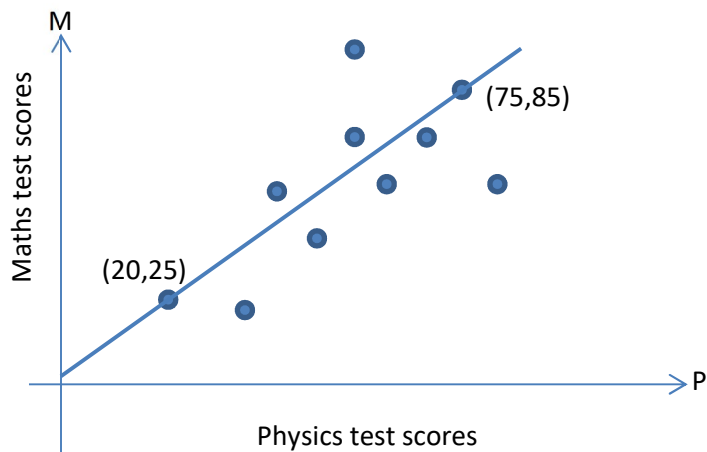
   a. Find the equation of the line of best fit in terms of M and P.
   b. If a pupil scored 66 in his physics test, use your line of best of to estimate their maths score.

Factorising

13.   a. $2x^2 − 8x$ b. $12a^2 − 15ab$ c. $x^2 − 36$

   d. $1 − a^2$ e. $9x^2 − 16y^2$ f. $3x^2 − 27$

   g. $x^2 + 2x − 15$ h. $x^2 − x − 12$ i. $x^2 + 10x − 24$

   j. $2x^2 − 7x + 3$ k. $7x^2 − 29x + 4$ l. $5x^2 − 17x + 6$
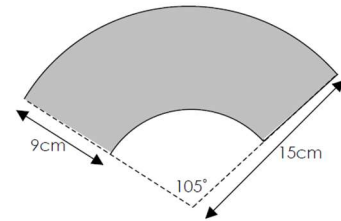
Circle Geometry

14.   Calculate the length of the minor arc AB.
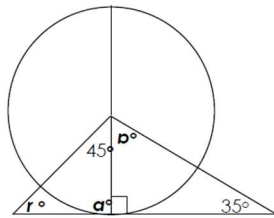
   a.   b.
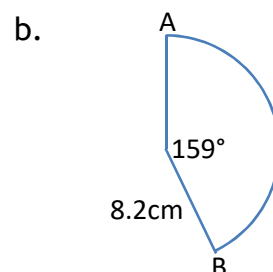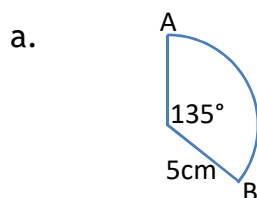
15. Calculate the area of the minor sector of Question 14.

16. Calculate the shaded area in the diagram opposite.
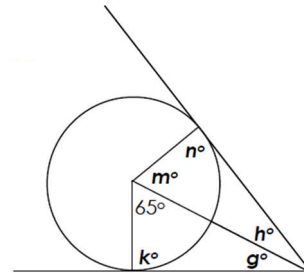

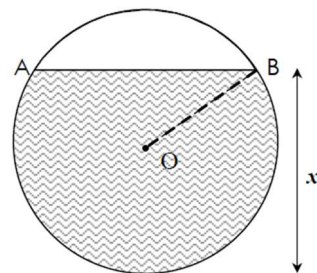
17. Calculate the size of the angles marked.

   a.   b.

18. The radius of the circle opposite is 12cm.

   The line AB is 20cm.

   Calculate the length of x.

Complete the square

19. Express the following in the form $(x + a)^2 + b$

   a. $x^2 + 4x + 5$ b. $x^2 - 6x - 4$ c. $x^2 + 5x - 2$

Functions

20.   a. Two functions, defined on suitable domains, are given by f(x) = $3x^2 + 5x$ and g(x) = $2x^2 + 6x$.

   i. Evaluate f(2)
   ii. Evaluate g(-3)

   b. Given the function f(x) = 3x – 4 and f(p) = 14, find the value of p.

Algebraic Fractions

21.   Simplify the following:

a. $\dfrac{3}{x} + \dfrac{4}{x^2}$

b. $\dfrac{4}{2a} - \dfrac{2}{3b}$

c. $\dfrac{4}{x+1} + \dfrac{3}{2x-2}$

d. $\dfrac{x+2}{3} + \dfrac{x+5}{2}$

e. $\dfrac{2a-1}{2} - \dfrac{a+4}{3}$

f. $\dfrac{x^2-2}{4} + \dfrac{2x^2+3}{5}$

g. $\dfrac{x^2-25}{x^2+7x+1}$

h. $\dfrac{x^2+6x+8}{x^2+7x+1}$

i. $\dfrac{x^2+4x-32}{x^2+10x+}$

Surds

22.   Simplify:

a. $\sqrt{18} + \sqrt{2} + \sqrt{50}$

b. $6\sqrt{3} - \sqrt{27} + \sqrt{300}$

c. $\sqrt{98} + \sqrt{32} - \sqrt{2}$

d. $\sqrt{48} + 2\sqrt{3} + \sqrt{75}$

23.   Express the following with a rational denominator, simplify where possible.

a. $\dfrac{4}{\sqrt{4}}$

b. $\dfrac{2}{\sqrt{5}}$

c. $\dfrac{3}{\sqrt{6}}$

Indices

24.   Simplify, leaving your answer with a positive index where possible.

a. $4a^2 \times 3a^4$

b. $(2b)^3 \times 4b^{-6}$

c. $(5m^2)^3 \div 10m^2$

d. $\dfrac{2c^3 \times 4c^5}{6c^{10}}$

e. $\dfrac{3x^7 \times 2x^{-3}}{4x^7}$

f. $3a^{\frac{2}{3}} \times 5a^{\frac{3}{7}}$

25.   Evaluate the following:

a. $8^{\frac{2}{3}}$

b. $9^{\frac{3}{2}}$

c. $8^{-\frac{1}{2}}$

d. 5^0

e. $\sqrt{4} + 3^0$

f. $(2x)^0$

Change the subject

26.   Change the subject of the formula to x.

a. $2x + y = 10$

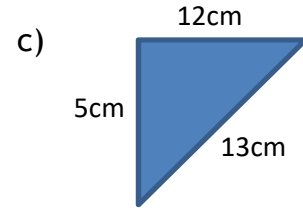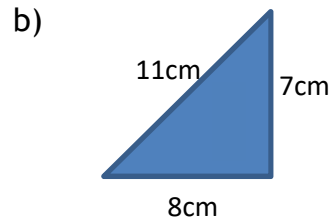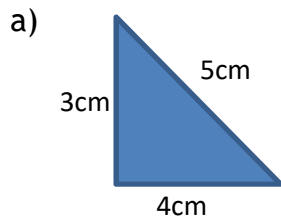b. $3x^2 + 4 = y$

c. $4 + z = 3 + 4x^2$

d. $\dfrac{3y}{x} = 2$

e. $\dfrac{xy^2}{5} = z$

f. $\dfrac{\sqrt{2xy}}{3} = 4$

Pythagoras

27. Are the following right angle triangles?

a)

3cm, 5cm, 4cm

b)

11cm, 7cm, 8cm

c)

12cm, 5cm, 13cm

Statistics

28. Write down a five figure summary and find the semi- interquartile range for:

   a. 12, 14, 15, 15, 16, 19, 20

   b. 5, 7, 13, 14, 12, 8, 10, 21

29. Find the mean and S.D of:

   a. 14, 25, 14, 28, 19

   b. 21, 24, 26, 24, 23, 35

Simultaneous Equations

30. Solve the following :

   a. $3a + 2b = 10$ b. $3c - 4d = -9$ c. $4f + 2g = 6$

   $5a - 3b = 4$ $2c + d = 5$ $3f + 5g = 1$

31. 2 adults and 3 children went to the cinema; their tickets cost a total of £41.

   a. Express the above information in an equation.

   3 adults and 4 children also attended the same film; their tickets cost a total of £58.

   b. Express the above information in an equation.
   c. What is the cost of an adult ticket and a child ticket?

Vectors

32. Vectors **a** and **b** are represented by $\binom{2}{4}$ and $\binom{-3}{5}$ respectively.

   Find:

   a. **a** + **b**   b.   2**a** + 3**b**   c.   2**a** – 2**b**   d.   3**b** – 2**a**

33. Vectors **m** and **n** are represented by $\begin{pmatrix} 3 \\ -2 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix}$ respectively.
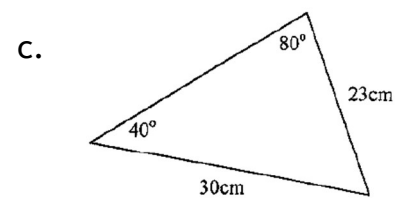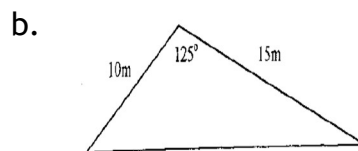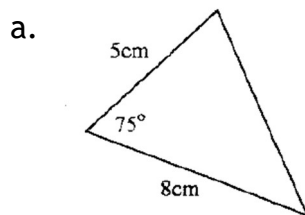
Calculate $|2\mathbf{m} + 3\mathbf{n}|$.

Volume

34. Calculate the volume of a hemi-sphere with diameter 14cm.

35. Calculate the volume of the shaded section given the radius of the base is 6cm and the radius of the top shaded section is 1cm. Give your answer correct to 3 significant figures.
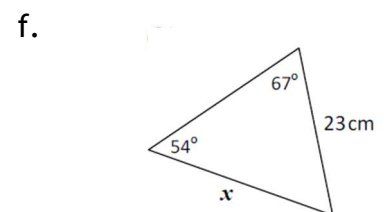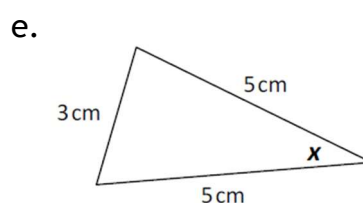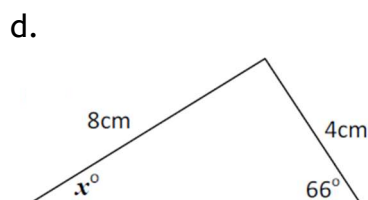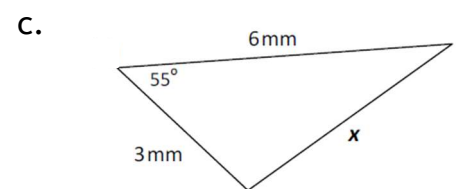

3·7cm

5·6cm
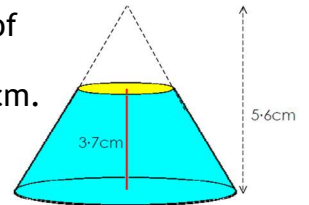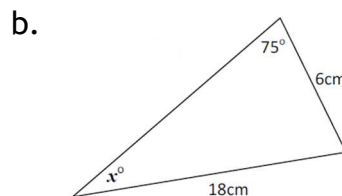
Trigonometry

36. Calculate the area of the triangles below.

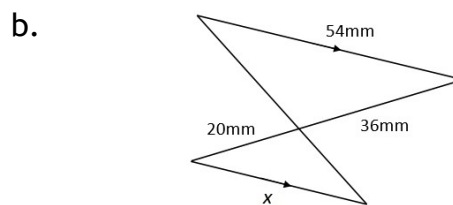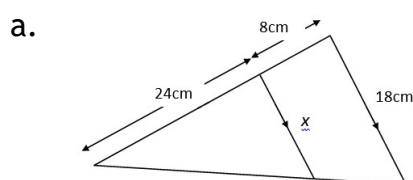a.

5cm
75°
8cm

b.

10m 125° 15m

c.

80°
23cm
40°
30cm

37. Find the length of x in the following:

a.

12 cm
38°
x
44°

b.

75°
6cm
x°
18cm

c.

6mm
55°
3mm
x

d.

8cm
4cm
x°
66°

e.

3 cm
5 cm
x
5 cm

f.

67°
23 cm
54°
x
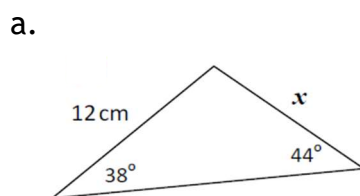
Similarity

38. Calculate the length of x in the following:

a.

8cm
24cm
18cm
x

b.

54mm
20mm
36mm
x

39.   Two perfume bottles are mathematically similar in shape.

6cm

9cm
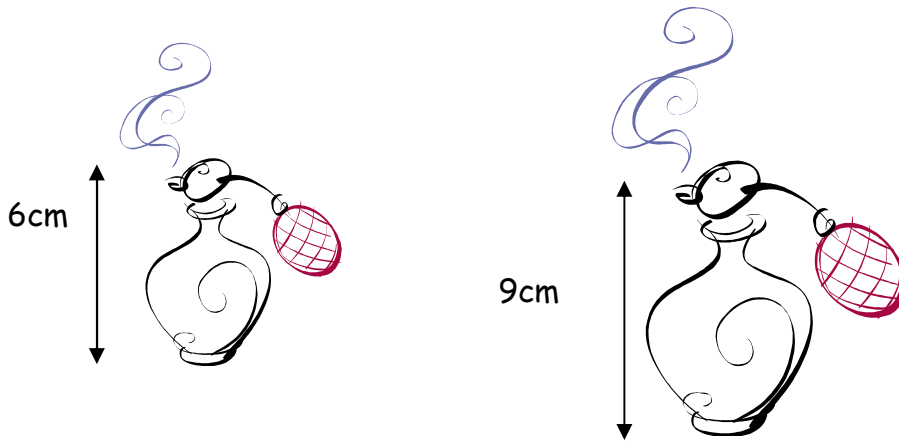
The smaller bottle is 6cm high and holds 30ml of perfume.
The larger bottle is 9cm high.
What volume of perfume will the larger bottle hold?