National 5 Maths – Practice Paper – Non-Calculator
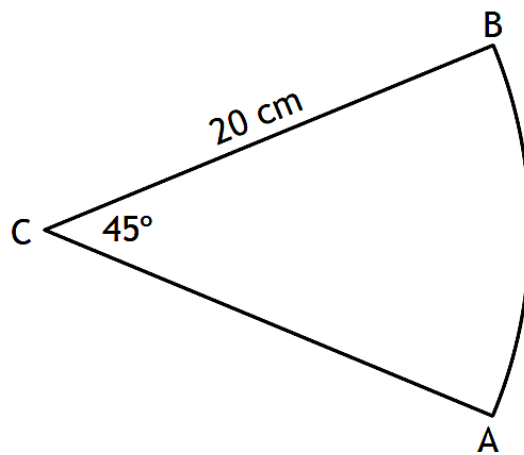
1) Evaluate (2)

$$1\frac{1}{8} \div \frac{3}{4}$$

2) Given that $f(x) = x^2 - 5x$, evaluate $f(-4)$. (2)

3) The diagram shows a sector of a circle, centre C. (3)

The radius of the circle is $20\ cm$ and angle ACB is $45°$.

Taking $\pi = 3.14$, calculate the area of the sector.

4) a) Express $x^2 - 6x + 15$ in the form $(x + a)^2 + b$. (2)

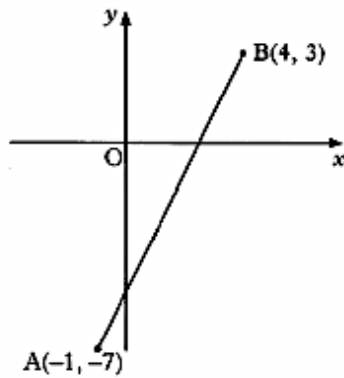 **b)** Hence state the coordinates of the turning point of the graph of (1)

 $y = x^2 - 6x + 15$.

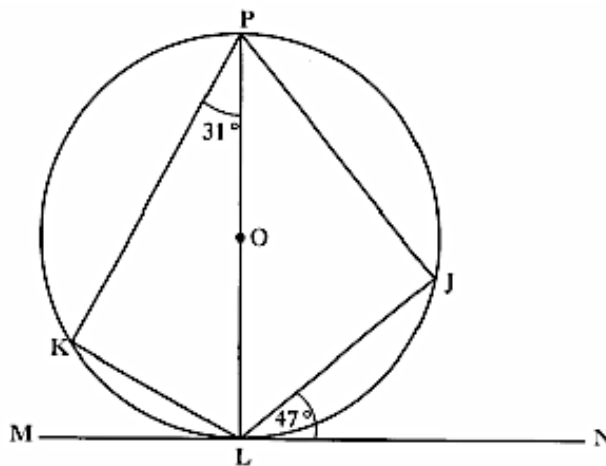**5)** Change the subject of the formula $y = ax^3 + c$ to x (3)

6) In the diagram below, A is the point $(-1, -7)$ and B is the point $(4, 3)$.

a) Find the gradient of the line AB. **(2)**

b) Find the equation of the line AB. **(1)**

c) The point $(3k, k)$ lies on AB. Find the value of k. **(2)**

7) **(3)**

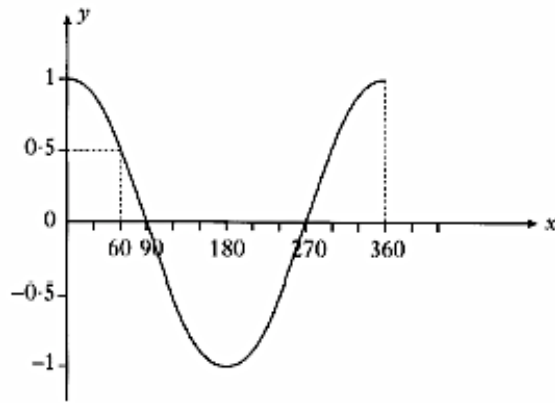
The tangent, MN, touches the circle, centre O, at L.

Angle $JLN = 47°$ and angle $KPL = 31°$
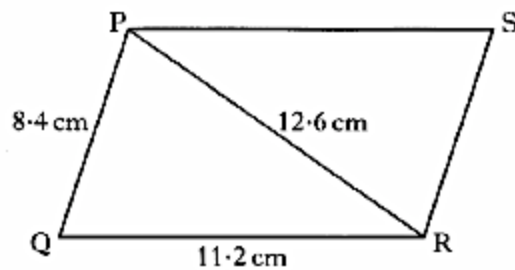
Find the size of angle JLK.

8) **(2)**

Part of the graph of $y = \cos x$ is shown above.

If $\cos 60° = 0.5$, state two values of x for which $\cos x = -0.5$.

9) The diagram shows a parallelogram, $PQRS$.

a) Calculate the size of angle PQR. **(3)**

b) Calculate the area of the parallelogram. **(3)**

10) Tommy buys flower seeds from a website. **(3)**

Tommy is given a 30% discount. He pays £16.10 for the seeds.

Calculate the cost of the flower seeds without the discount.

11) Simplify the expression $\dfrac{(2a^3)^2}{a^8}$ **(3)**

Write your answer with a positive power.

12) Simplify $\dfrac{p^2 - 4q^2}{3p + 6q}$ **(3)**

13) $f(x) = 4\sqrt{x} + \sqrt{2}$

    a) Find the value of $f(72)$ as a simplified surd. **(3)**

    b) Find the value of t for which $f(t) = 3\sqrt{2}$
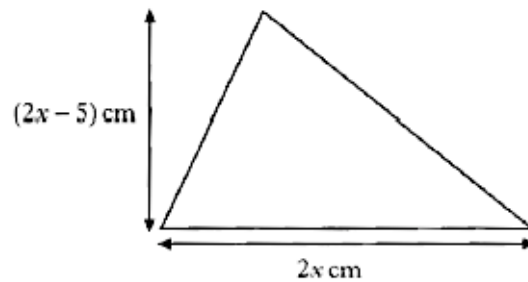
14) Sketch the graph of $y = x^2 - 4x - 12$ indicating on your sketch the points of **(3)**

    intersection with the x-axis and the y-axis, and the coordinates of the turning point.

15) The height of a triangle is $(2x - 5)$ centimetres and the base is 2x centimetres. **(5)**

The area of the triangle is 7 square centimetres.

Calculate the value of x.

National 5 Maths – Practice Paper – Calculator

1) Expand and simplify $3(2x - 4) + 4(3x^2 + 1)$ **(3)**

2) In the evening the temperature in a greenhouse drops by 10.4% per hour. **(3)**

At 8 p.m. the temperature was 28° Celsius. Calculate the temperature at 11pm.

3) A pharmaceutical company makes vitamin pills in the shape of spheres of radius $0.5\ cm$.

a) Calculate the volume of one pill to 3 significant figures. **(3)**

The company decides to change the shape of each pill to a cylinder. The new pill has the same volume as

The original and its diameter is $1.4\ cm$.

b) Calculate the height of the new pill. **(3)**

4) Andrew and Daisy each book in at the Sleepwell Lodge.

a) Andrew stays for 3 nights and has breakfast on 2 mornings. His bill is £145.

Write an equation to illustrate this information. **(1)**

b) Daisy stays for 5 nights and has breakfast on 3 mornings. Her bill is £240.

Write an equation to illustrate this information. **(1)**

c) What is the cost of one breakfast? **(3)**

5) a) The price, in pence, of a carton of milk in six different supermarkets is shown below.

66   70   89   75   79   59

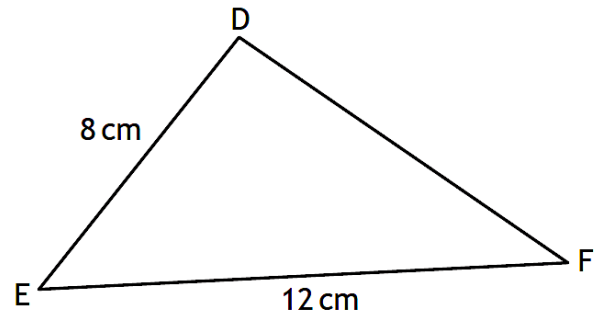Calculate the mean and standard deviation of these prices. **(4)**

b) In six local shops, the mean price of a carton of milk is 73 pence with a standard deviation

of 17.7 pence.

Compare the supermarket prices with those of the local shops. **(2)**

6) In triangle DEF: **(2)**

$DE = 8cm, EF = 12\ cm$ and $\sin E = \dfrac{2}{3}$

Calculate the area of triangle DEF.

7) Solve, to 1 decimal place, the equation $2x^2 + 3x - 1 = 0$. **(4)**

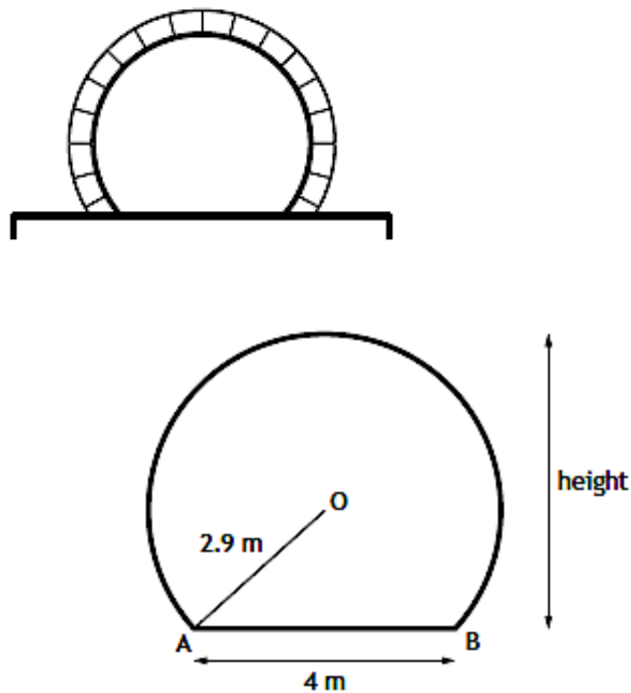**8)** Express in its simplest form $\sin x \cos x \tan x$. **(2)**

9) Solve the equation $4 \cos x - 3 = -5$ for $0 \leq x \leq 360°$. **(3)**

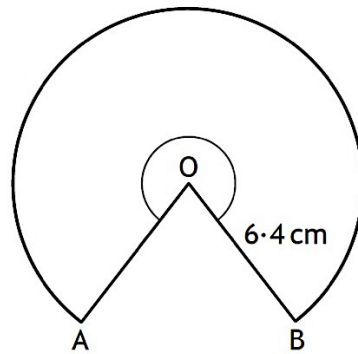**10)** A train tunnel has a circular cross-section with a horizontal floor. **(4)**

A diagram of the cross-section is shown below. Calculate the height of the tunnel.

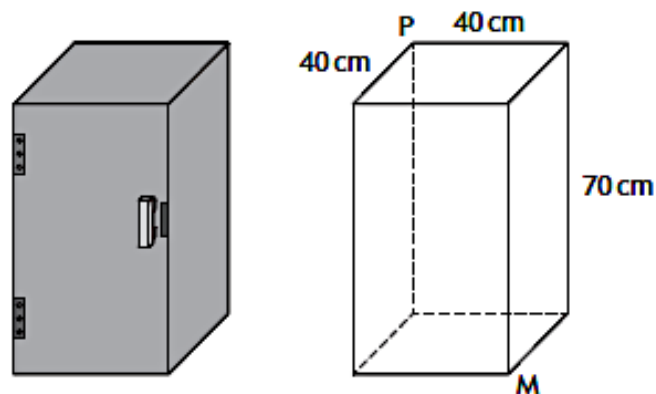**11)** The diagram below shows part of a circle, centre O. **(4)**

The radius of the circle is $6.4\ cm$ and the major arc AB has length $31.5\ cm$.

Calculate the size of the reflex angle AOB.

12) Chris wants to store his umbrella in a locker.

The locker is a cuboid with internal dimensions of length $40\ cm$, breadth $40\ cm$ and height $70\ cm$.

The umbrella is $85\ cm$ long. He thinks it will fit into the locker from corner P to corner M.

Is he correct? Justify your answer.

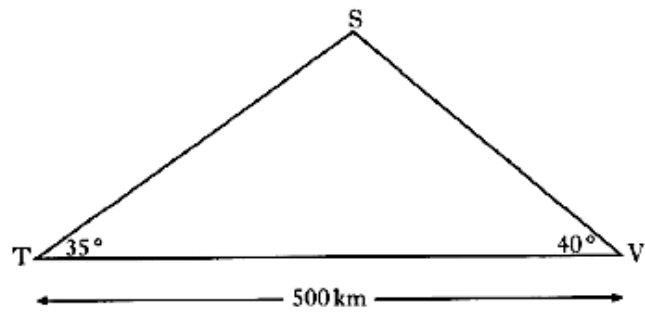**13)** Write as a single fraction **(3)**

$$\frac{2}{(x-3)} - \frac{3}{(x+5)}$$

14) A TV signal is sent from a transmitter (T) via a satellite (S) to a village (V), as shown in the diagram.   **(5)**

The village is 500 km from the transmitter.

The signal is sent out at an angle of 35° and is received in the village at an angle of 40°.

Calculate the height of the satellite above the ground.

National 5 Maths – Key Skills Practice - Questions

1) Expand the brackets and simplify the expression

a) $4(a - 5) + 3(2a + 1)$　　**b)** $x(x - 2) - x(3x + 5)$　　**c)** $x(x - 2) + x^2 - 3$

2) Factorise the expression using two brackets

a) $x^2 - 8x + 12$　　**b)** $x^2 + 3x - 18$　　**c)** $x^2 - x - 20$

3) Change the subject of the formula to t

a) $3t^2 + r = s$　　**b)** $\sqrt{t + 3} = s$　　**c)** $\frac{1}{2}\sqrt{2t - 4} = s$

4) Simplify the algebraic fraction

a) $\frac{x^2 - x - 6}{x^2 - 9}$　　**b)** $\frac{a^2 - 4}{a^2 + 5p + 6}$　　**c)** $\frac{a^2 - 3a}{a^2 + 6a}$

5) Evaluate the following

a) $\frac{2}{(x - 1)} - \frac{1}{(x + 1)}$　　**b)** $\frac{2}{p} - \frac{1}{(p - 2)}$　　**c)** $\frac{5}{(x - 3)} + \frac{3}{(x + 1)}$

6) Solve the following equations

a) $6y - 11 = 2y + 5$

b) $2b + 7 = 11 - 3b$

c) $5x - 7 = 3x$

d) $x = 3x - 2 + 7$

7) Solve the following

a) $3r - 7(1 + r) = 12$

b) $z(z + 2) = z^2 + 6$

c) $\frac{x+2}{2} + \frac{x-1}{5} = \frac{1}{20}$

d) $\frac{2}{x} + \frac{1}{3} = 5$

e) $7k > 3k - 16$

f) $8 + 2x > 3(4 - x)$

8) Solve the following systems of equations

a) $5x - 4y = 24$
   $2x - y = 9$

b) $-3x + 2y = 5$
   $4x + 3y = -1$

9) Simplify the following expressions containing surds

a) $\sqrt{32} + \sqrt{8}$

b) $\sqrt{50} \ x \ \sqrt{2}$

10) Write the following fractions with a rational denominator and simplify

a) $\frac{1}{\sqrt{12}}$

b) $\frac{3\sqrt{2}}{\sqrt{3}}$

11) Simplify the following writing your answer with a positive index

a) $(2^{-1})^3$

b) $\frac{3}{3^{-4}}$

12) Evaluate, giving your answer as a whole number

a) $27^{\frac{2}{3}}$

b) $25^{\frac{3}{2}}$

13) Solve these quadratic equations by factorising

a) $x^2 - 6x - 16 = 0$

c) $x^2 - 49 = 0$

b) $x^2 - 10x + 16 = 0$

d) $x^2 - 2x - 24 = 0$

14) Determine the nature of the roots of the equation

a) $x^2 - 3x - 3 = 0$

b) $2x^2 + 5 = 0$

15) Determine the co-ordinates of the roots of these quadratic functions

a) $y = (x - 2)(x + 3)$

c) $y = x^2 + 8x + 15$

b) $y = -2x(x + 3)$

d) $y = x^2 - 3x - 10$

16) State the co-ordinates of the turning point of these quadratic functions

a) $y = (x - 3)^2 + 1$

b) $y = -(x - 2)^2 - 2$

17) Work out the co-ordinates of the turning point of these quadratics by writing them in

the form $y = (x - p)^2 + q$

a) $y = x^2 - 8x + 3$

b) $y = x^2 + 6x + 17$

18) Solve the equation for $0 \leq x \leq 360°$

a) $2 \tan x - 2 = 0$

b) $3 \cos x - 0.6 = 1$

c) $3 \cos x - 1 = 0$

19) Work out the equation of the straight line passing through the following points

a) $A = (3, 4), \ B = (-1, 8)$

b) $A = (1, 3), \ B = (-1, -3)$

20) Work out the x and y intercept of the following straight lines

a) $2y = 4x - 8$

b) $\frac{1}{3} y = 9x + 6$

21) Calculate the <u>semi-interquartile</u> range for the following sets of numbers

12 34 45 2 33 56 78 22 12 15 78 54

22) Calculate the mean and standard deviation for the following sets of numbers

34 45 23 48 69 21 17 5 26 89

23) A runner records her times during training over a two-week period. In the first week,

her mean time was 54 seconds and the standard deviation of her results was 4.5.

In the second week, her mean time was 51 seconds and the standard deviation of her

results was 3.8. Make two comparisons about her results.
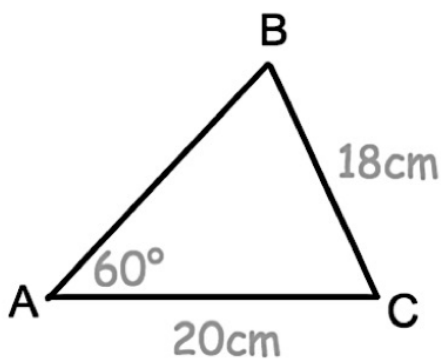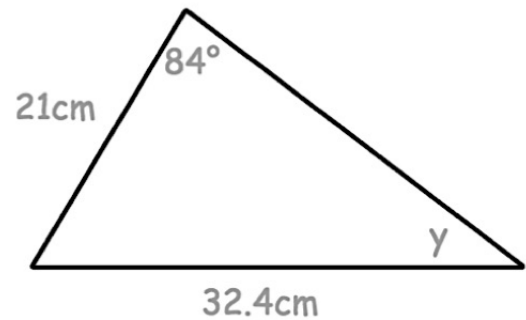
24) Work out the area of the triangles

   a)   **b)**

6cm

60°

7cm

84°

21cm

y

32.4cm
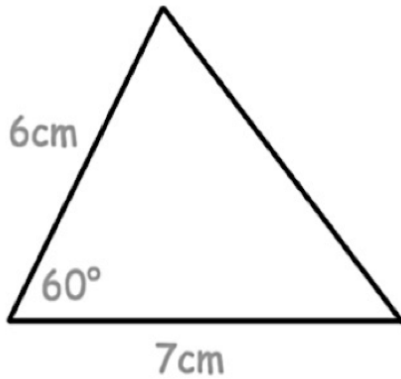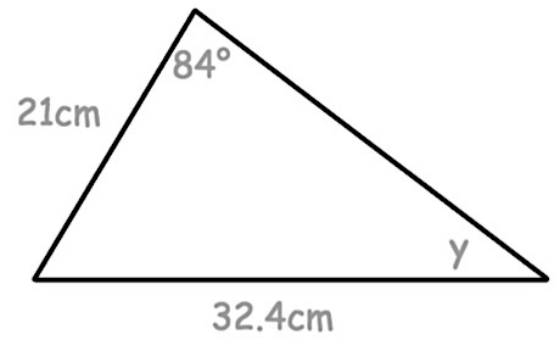
25) Work out the missing <u>angle</u> indicated in the following questions

a)   **b)**

B

18cm

60°

A

20cm

C

Calculate the size of the angle ABC

84°

21cm

y

32.4cm

Calculate the size of the angle y