Mathematics 5 SN

GREATEST INTEGER FUNCTION

1 A pastry chef orders sugar from his supplier. The cost of delivery, *C(n)*, depends on the number, *n*, of kilograms of sugar ordered. The supplier charges a flat rate of $10 for delivery. However, he gives a rebate of $0.40 for every 100 kg of sugar delivered.

The pastry chef recorded the delivery costs for the last five orders in the table below.

Quantity *n* of sugar ordered (kg)	Cost of Delivery *C(n)* ($)
50	10
75	10
100	9.60
210	9.20
280	9.20

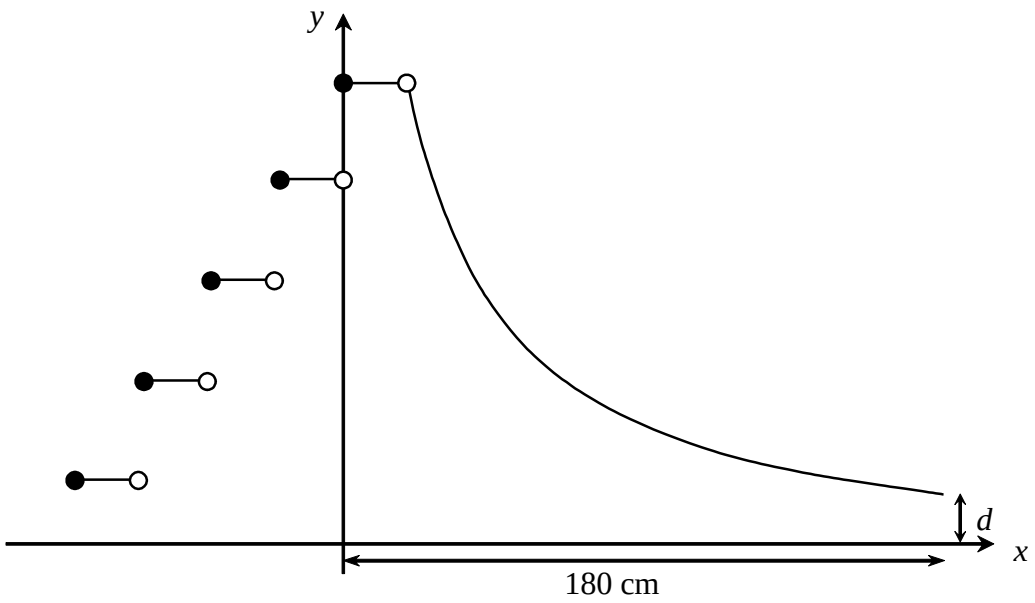
The delivery costs for today's order was $4.

What are all the possible quantities of sugar the pastry chef could have ordered today?

Show all your work.

Answer: The possible quantities of sugar, in kilograms, are _____.

2 A designer is preparing a model of a children's slide. She began by drawing the steps and the slide on a Cartesian plane scaled in cm, as shown in the diagram below.



The steps of the slide are represented by the relation $y = 32.5[0.05x + 3] + 52.5$.

The top step begins on the *y*-axis. The slide is attached to the other end of the top step.

The slide is represented by a rational function with the equation $y = \frac{a}{x + 10} - 10$.

The end of the slide is 180 cm from the origin of the Cartesian plane.

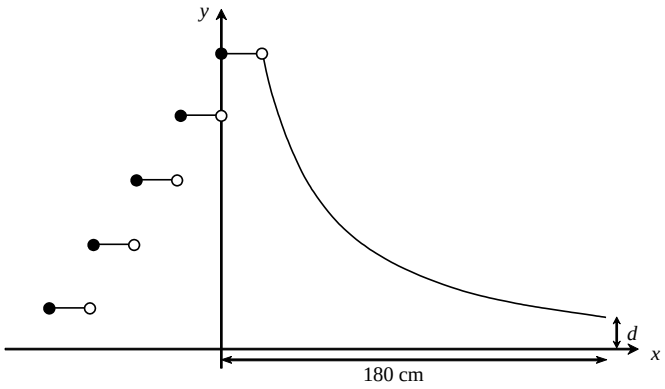
To the nearest tenth of a centimetre, what is the distance (d) from the ground to the end of the slide?

Show all your work.

Show all your work.

Relation representing steps:

$y = 32.5[0.05x + 3] + 52.5$



Rational function representing slide:

$$y = \frac{a}{x + 10} - 10$$

Answer: To the nearest tenth of a centimetre, the distance is _____ cm.

3 The weekly salary s(*n*) of a car salesperson is established by the equation

$$s(n) = 200\left[\frac{1}{2}(n+3)\right] + 200$$

where n is the number of cars sold in a week.

What salaries are possible for someone who sells fewer than 8 cars?

A) $500, $600, $700, $800, $900, $1000, $1100, $1200

B) $0, $600, $800, $1000, $1200

C) $600, $800, $1000, $1200

D) $400, $600, $800, $1000, $1200

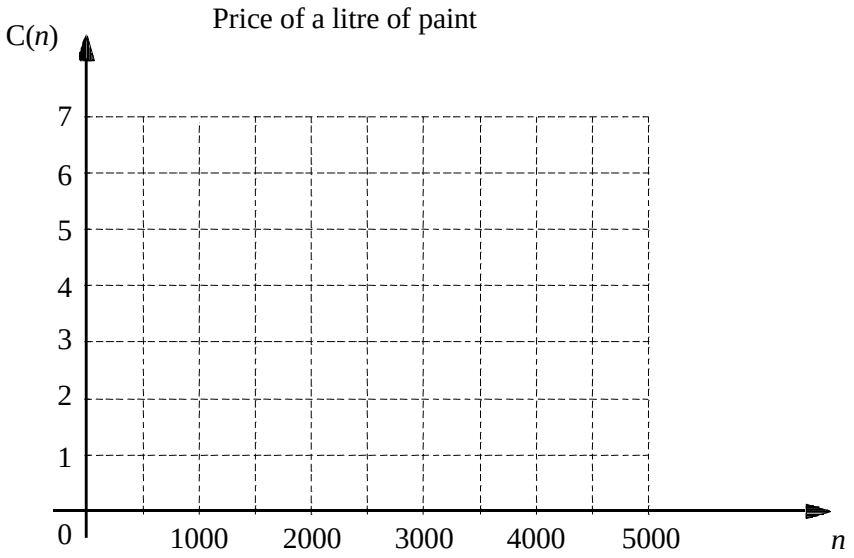
4 A paint company computerized its billing service using a program based on the function c(n) defined below.

Price of a litre of paint

$$c(n) = -\left[\frac{n}{1000}\right] + 7$$

where c(*n*) represents the price of one litre of paint and n the number of litres sold.

Draw the graph of this function for $0 \leq n < 4000$.



5 The cost C, in dollars, to send a parcel is given by the function C(x) = [2.75x] + 1.25 where x is the mass in kg.

How much will it cost Danielle to send a parcel that weighs 4.4 kg?

It will cost $\$$_____ to send the parcel.

6 The function f is defined by the following rule:

$$f(x) = 3\left[-\frac{(x-1)}{2}\right] + 6$$

What are the zeros of this function?

A)]1.5, 2[

B)]3, 5]

C)]5, 8[

D) [5, 8[

2- Correction key

1 Example of an appropriate solution

Rule of Correspondence

$C(n) = 10 - 0.40\left[\frac{n}{100}\right]$

Number of kilograms of sugar ordered:

$4 = 10 - 0.40\left[\frac{n}{100}\right]$

$-6 = -0.40\left[\frac{n}{100}\right]$

$15 = \left[\frac{n}{100}\right]$

Trial and error is an acceptable method of determining the solution set.

Answer: The possible quantities of sugar, in kilograms, are [1500, 1600[.

Note: Accept an equivalent notation for the solution set.

2 Example of an appropriate solution

Greatest integer function

$$x = 0 \Rightarrow \quad y = 32.5\left[0.05(0) + 3\right] + 52.5$$
$$= 32.5[3] + 52.5$$
$$= 150 \text{ cm}$$

Step length = $\frac{1}{0.05}$ = 20 $\Rightarrow$ Last open point is (20, 150)

Rational function

$$y = \frac{a}{x + 10} - 10$$
$$150 = \frac{a}{20 + 10} - 10$$
$$160 = \frac{a}{30}$$
$$a = 4800$$

Equation

$$y = \frac{4800}{x + 10} - 10$$

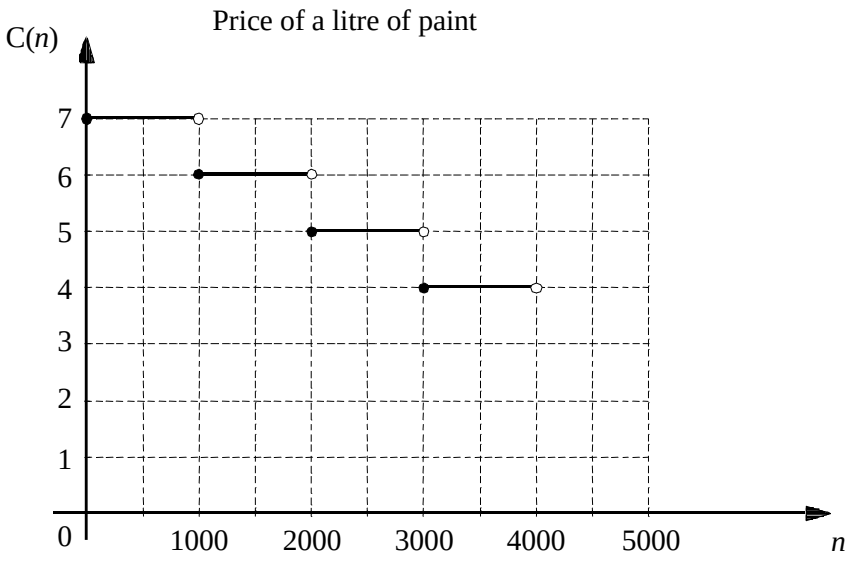
$$x = 180 \Rightarrow \quad y = \frac{4800}{180 + 10} - 10$$
$$\approx 15.26 \text{ cm}$$

Answer: To the nearest tenth of a centimetre, the distance is **15.3** cm.

Note: Students who use an appropriate method in order to correctly determine the point (20, 150) have shown they have a partial understanding of the problem.

3 D

4 Price of a litre of paint



5 It will cost $13.25 to send the parcel.

6 B